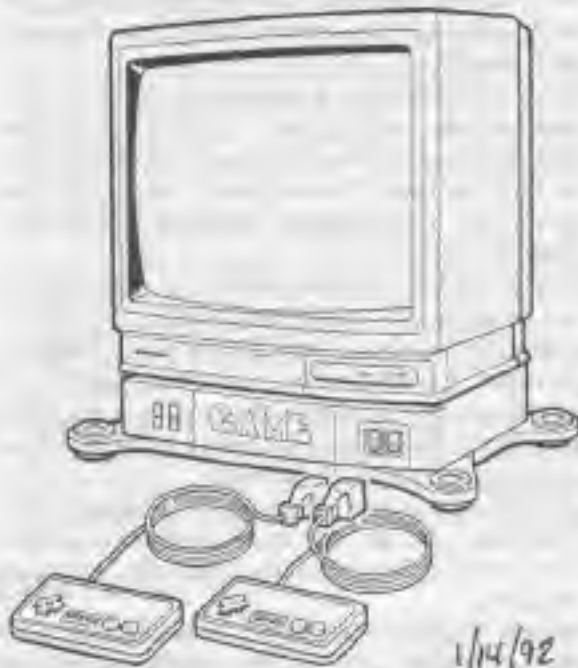


# SHARP SERVICE MANUAL

599N919SV111



## GAME TELEVISION SIGMA 9400 CHASSIS Chassis No. 19M1

## MODEL 19SV111

In the interests of user-safety (Required by safety regulations in some countries) the set should be restored to its original condition and only parts identical to those specified should be used.

CARTRIDGE CONNECTOR Q90CN7202CEZZ \$44.00 \$6.00  
2 CONTROLLERS R2MR60688CESA \$29.00 \$4.00

### CONTENTS

	Page
• IMPORTANT SERVICE SAFETY PRECAUTION	2
• ELECTRICAL SPECIFICATIONS	3
• LOCATION OF USER'S CONTROLS	4
• REMOVAL OF CABINET	6
• INSTALLATION AND SERVICE INSTRUCTIONS	8
• TROUBLE SHOOTING TABLE	10
• CHASSIS LAYOUT	16
• PRINTED WIRING BOARD ASSEMBLIES	17
• BLOCK DIAGRAM	21
• SOLID STATE DEVICE BASE DIAGRAM	26
• SCHEMATIC DIAGRAM AND WAVEFORMS	28
• REPLACEMENT PARTS LIST	35
• PACKING OF THE SET	44

## SHARP ELECTRONICS CORPORATION

Service Headquarters: Sharp Plaza, Mahwah, New Jersey 07430-2135 Phone: (201) 512-0055

## IMPORTANT SERVICE SAFETY PRECAUTION ( Continued )

- Use an AC voltmeter having with 5000 ohm per volt, or higher, sensitivity to measure the AC voltage drop across the resistor.
- Make contact with the test probe on all exposed metal parts having a return path to the chassis (antenna, metal cabinet, screw heads, knobs and control shafts, escutcheon, etc.) and measure the AC voltage drop across the resistor.

All checks must be repeated with the AC cord plug connection reversed (if necessary, a non-polarized adapter plug may be used only for the purpose of completing these checks).

Any current measured must not exceed 0.5 milliamps.

Any measurements not within the limits outlined above are indicative of potential shock hazard and corrective action must be taken before returning the set to the customer.

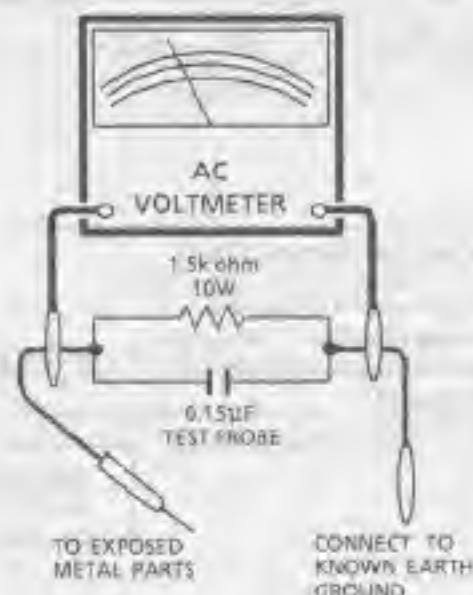
### SAFETY NOTICE

Many electrical and mechanical parts in television receivers have special safety-related characteristics.

These characteristics are often not evident from visual inspection, nor can protection afforded by them be necessarily increased by using replacement components rated for higher voltage, wattage, etc.

Replacement parts which have these special

safety characteristics are identified in this manual; electrical components having such features are identified by "Δ" and shaded areas in the Replacement Parts Lists and Schematic Diagrams. For continued protection, replacement parts must be identical to those used in the original circuit. The use of a substitute replacement parts which do not have the same safety characteristics as the factory recommended replacement parts shown in this service manual, may create shock, fire, X-radiation or other hazards.



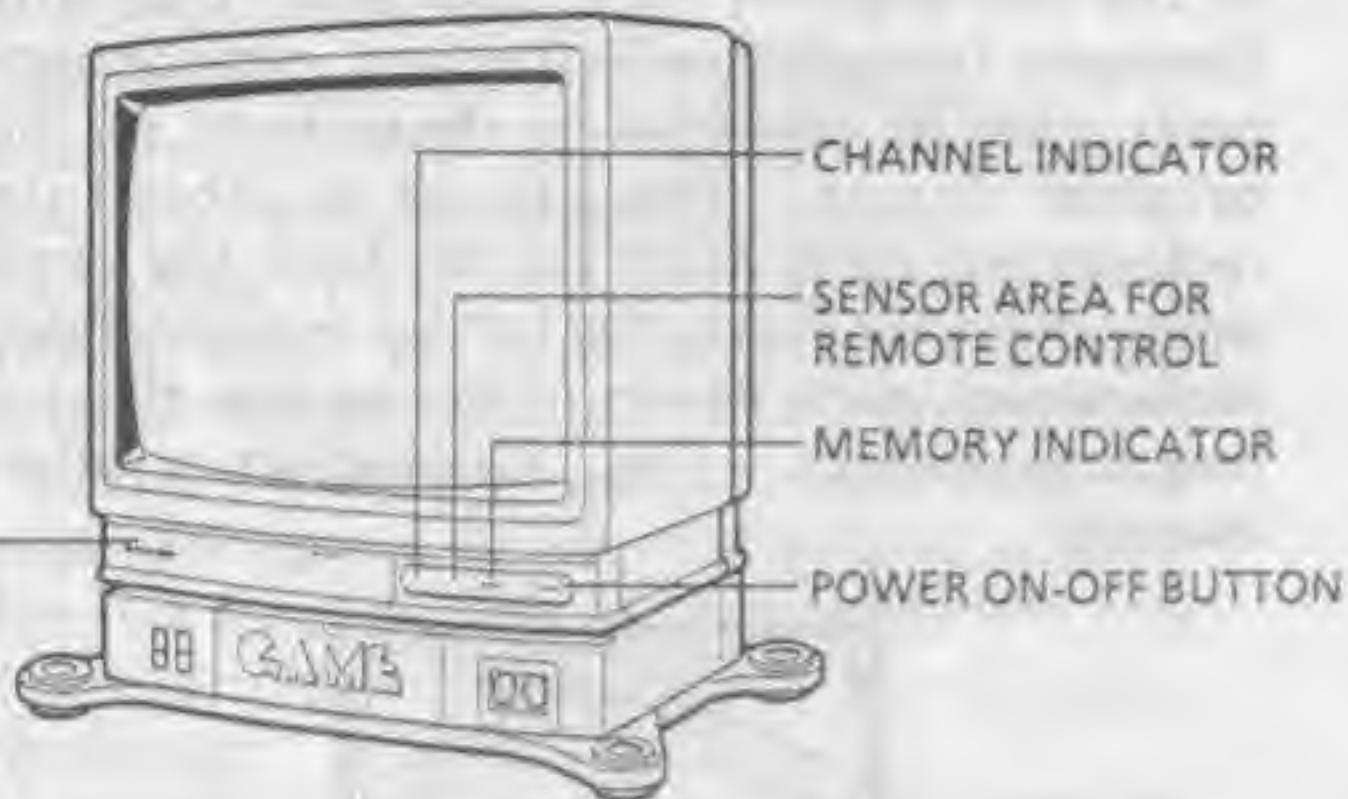
## ELECTRICAL SPECIFICATIONS

VHF ANTENNA INPUT IMPEDANCE	75 ohm Unbalanced
UHF ANTENNA INPUT IMPEDANCE	300 ohm Balanced
CONVERGENCE	Magnetic
FOCUS	Hi-Bi-Potential Electrostatic
AUDIO POWER OUTPUT RATING	1.2 W (at 10% distortion)
INTERMEDIATE FREQUENCIES	
Picture IF Carrier Frequency	45.75 MHz
Sound IF carrier Frequency	41.25 MHz
Color Sub-Carrier Frequency	42.17 MHz (Nominal)
PICTURE SIZE	Approx. 185 sq. in.
POWER INPUT	120 V AC 60Hz
POWER RATING	95 W
SPEAKER SIZE	4" PM, 0.52 oz. Mag.
VOICE COIL IMPEDANCE	8 ohm at 400 Hz
SWEEP DEFLECTION	Magnetic
TUNING RANGES	VHF-Channels 2 thru 13 UHF-Channels 14 thru 83 CATV Channels 1 thru 65, 95 thru 99 (EIA, Channel Plan)

Specifications are subject to change without prior notice.

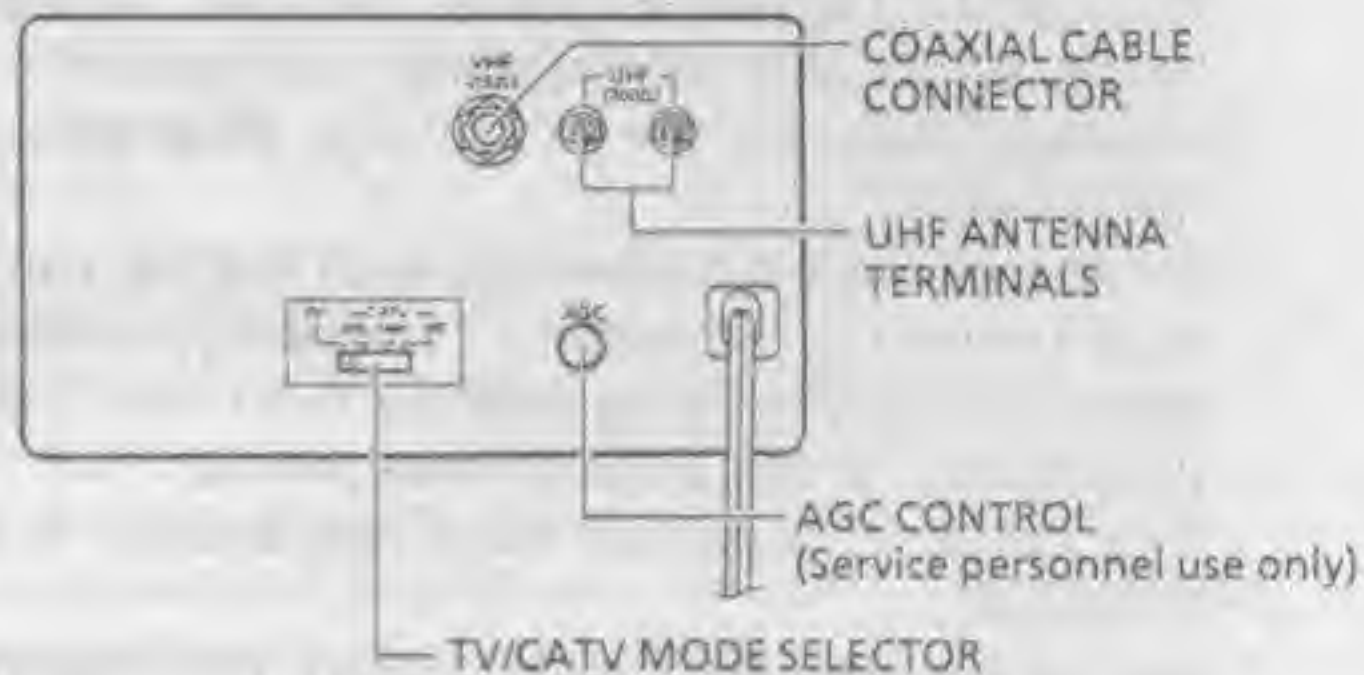
# LOCATION OF USER'S CONTROL (TV)

## Front



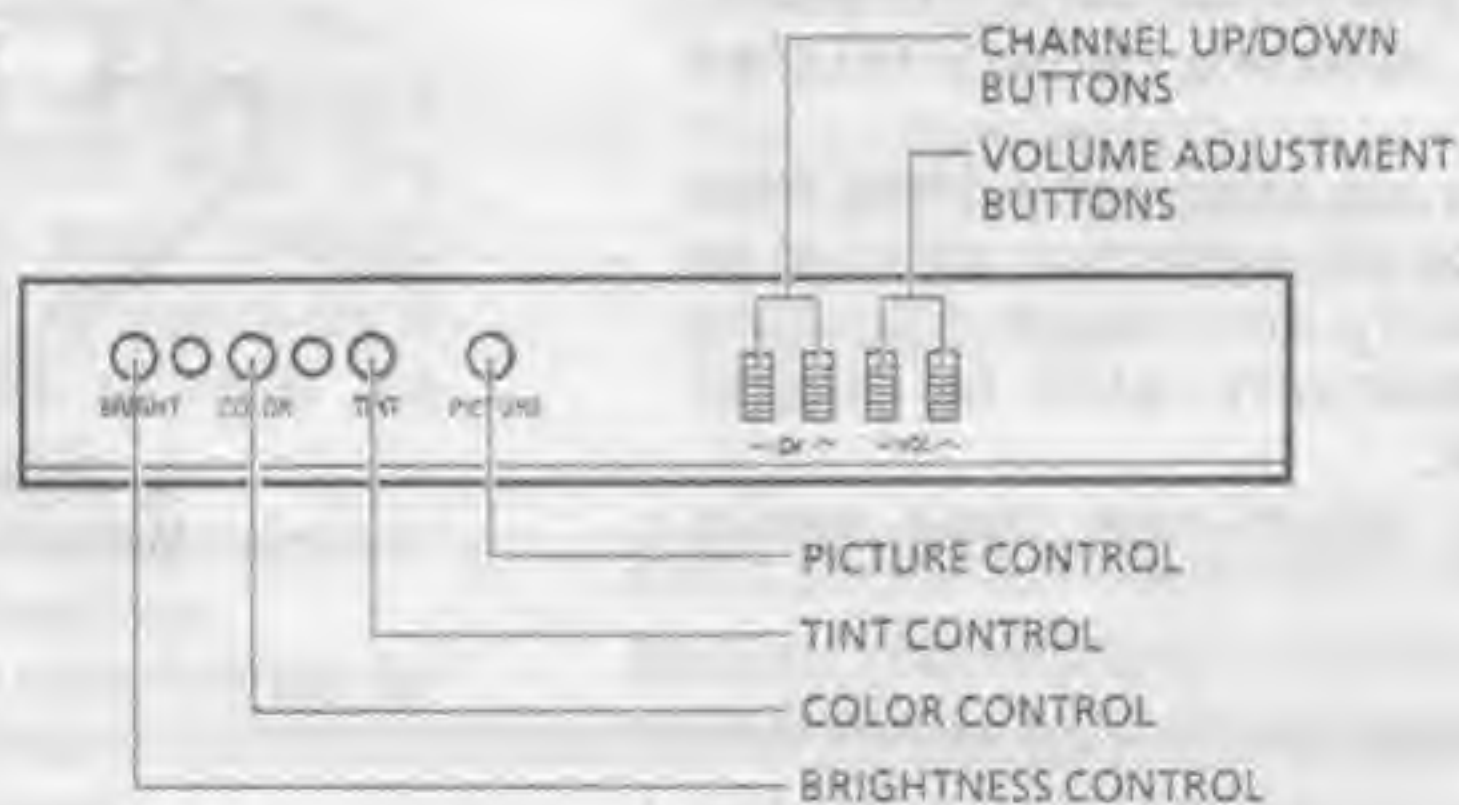
## Antenna Terminal Board

(Located on the rear of the cabinet)



## Control Access Door

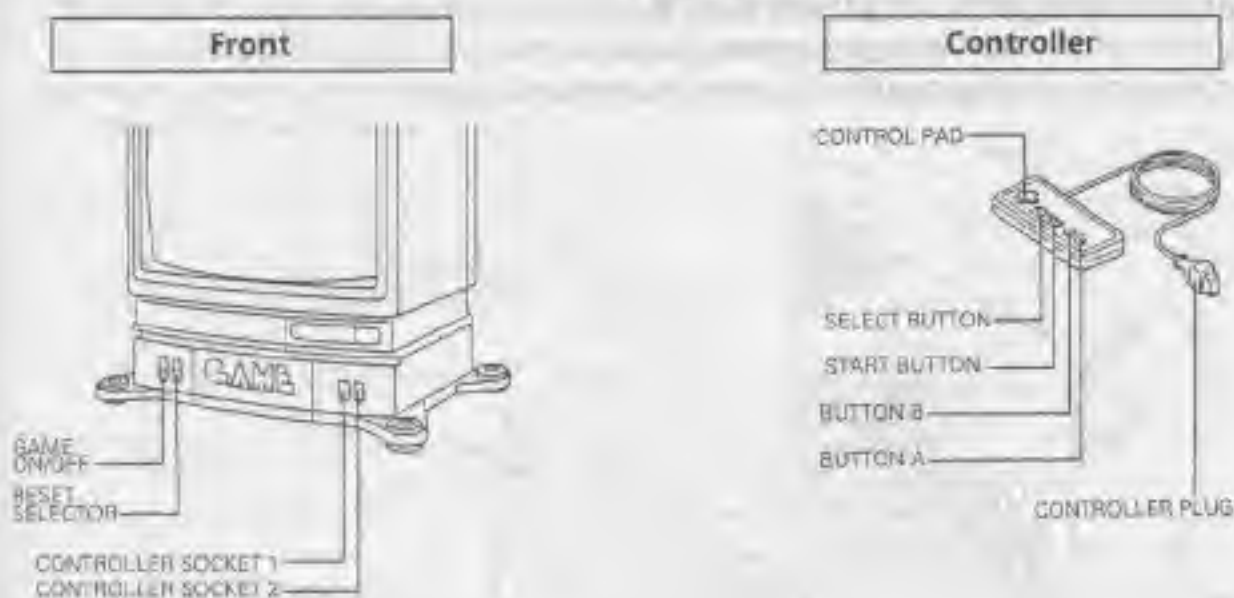
(How to open the door)  
To open the door, be sure to push the position marked "PUSH ON".



## Infrared Remote Control

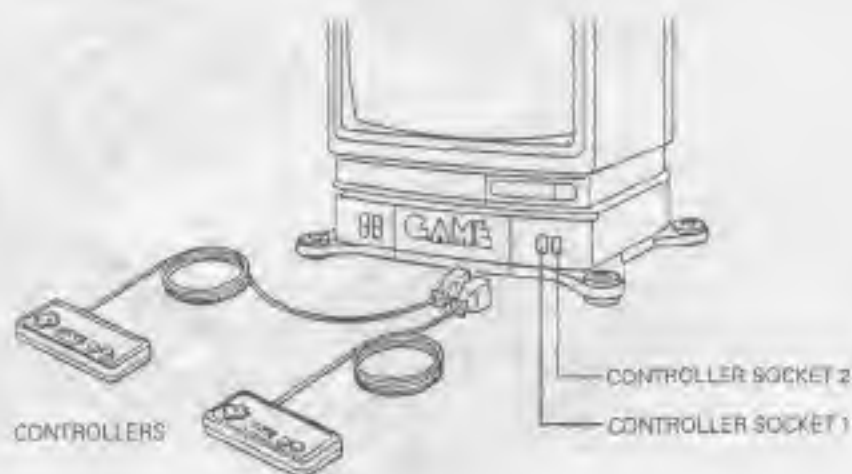


## LOCATION OF USER'S CONTROL (Continued) (GAME)



### CONNECTING THE CONTROLLERS TO THE TV

Both controllers are identical and may be connected to either controller socket. However, the controller connected to controller socket 1 becomes Controller 1. The distinction is important when selecting and starting games, since only Controller 1 is used to select and start games.



### Operation of Controls (GAME)

1. Turn the power on by pressing the POWER ON-OFF BUTTON on the set or on the Remote Control.
2. Set the TV mode by pressing the TV/GAME SELECTOR on the set or on the Remote Control.

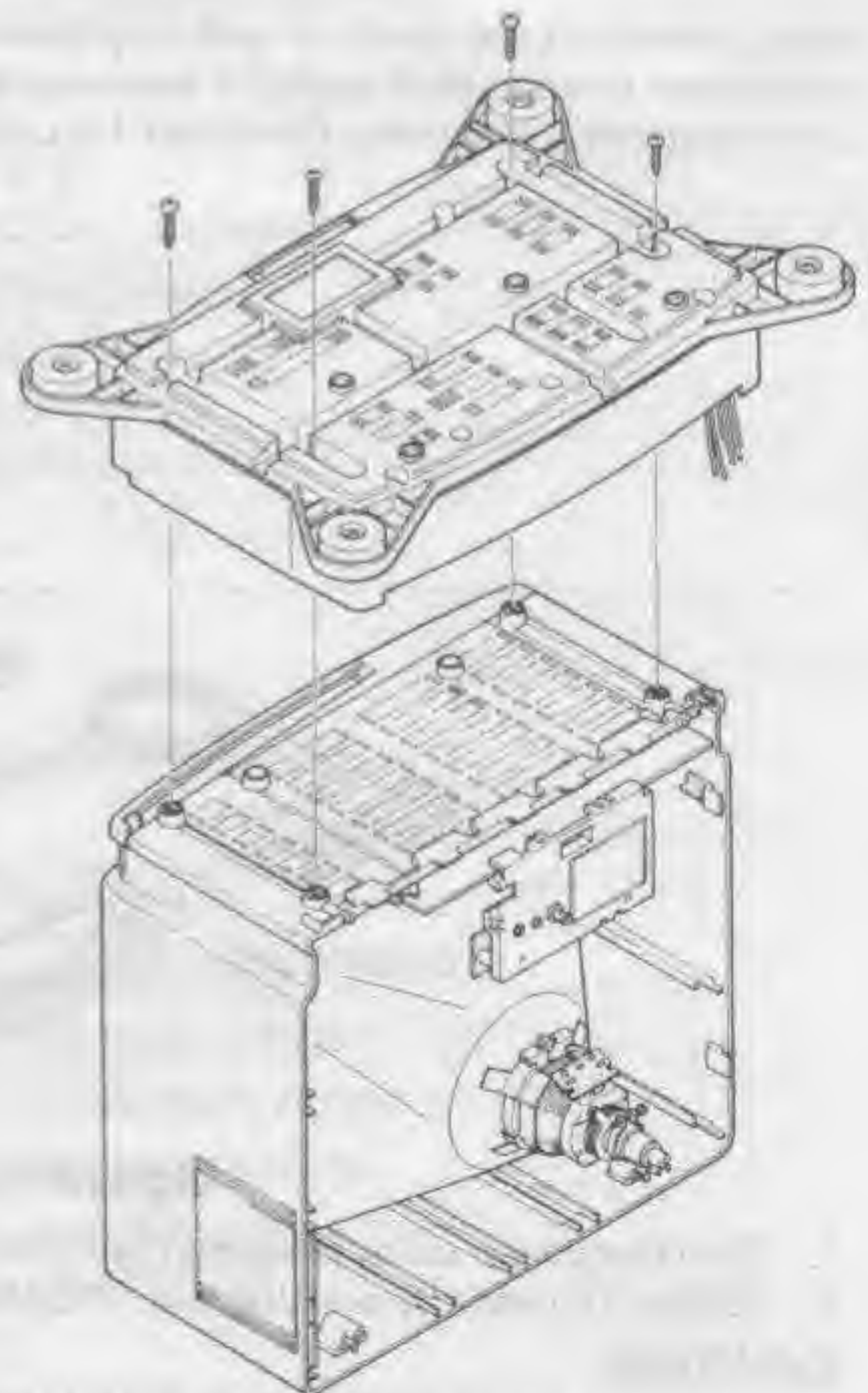
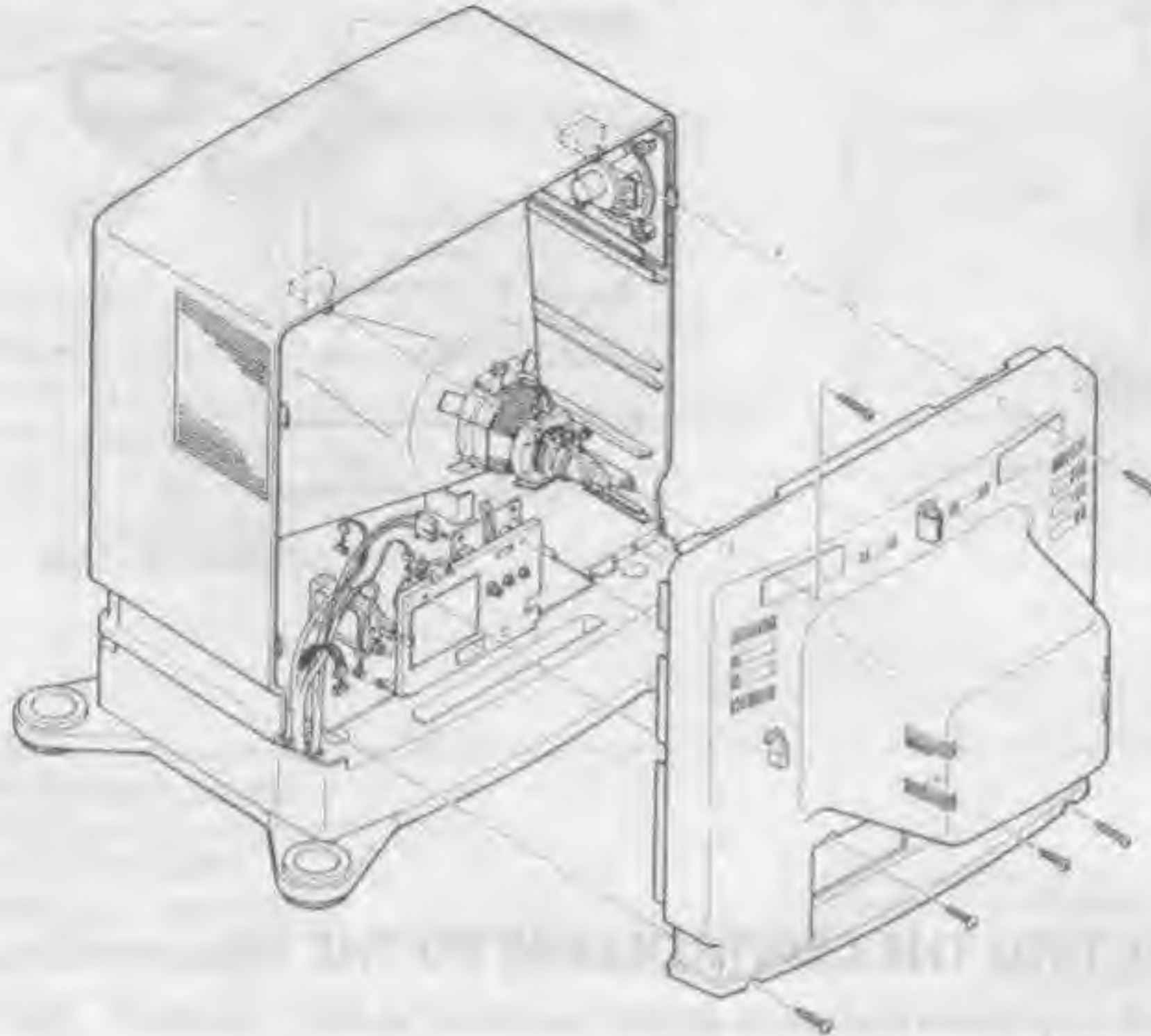
#### CAUTION:

**ALWAYS MAKE SURE THE TV/GAME SELECTOR IS SET THE TV MODE BEFORE INSERTING OR REMOVING A GAME PAK.**

## REMOVAL OF CABINET

### How to detach the game unit from the TV set

1. Unscrew the six rear cabinet set-screws and remove the rear cabinet.
2. Disconnect the game unit connectors (EB, N, V, A and EA) from the TV set.

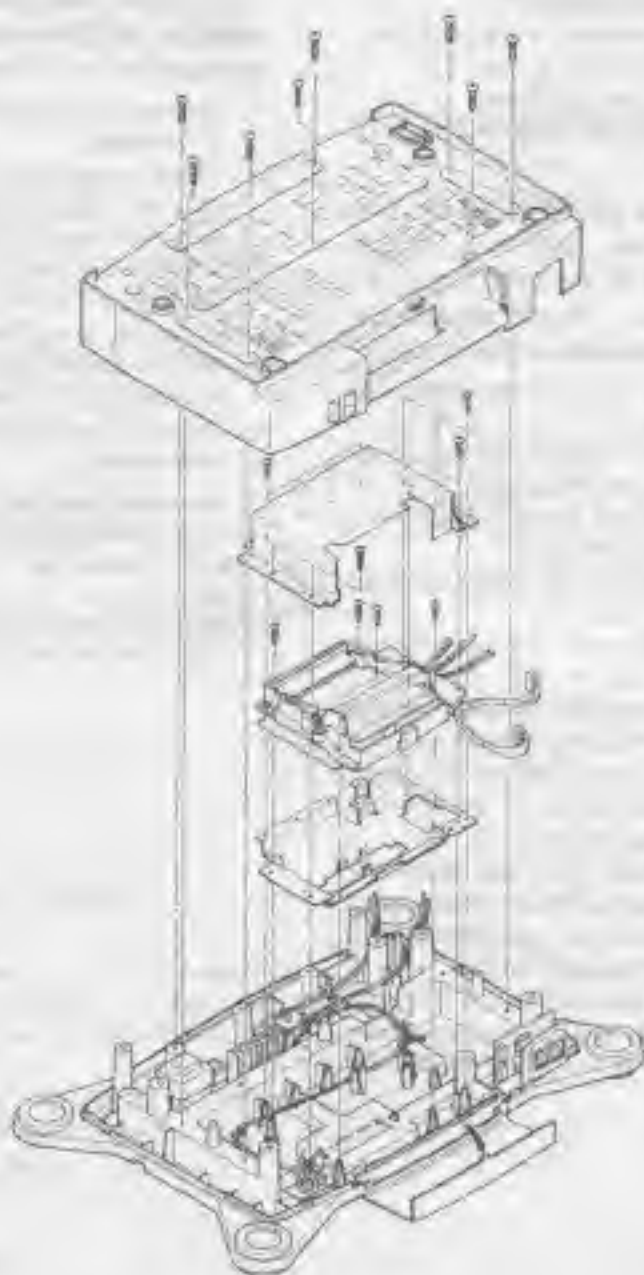


3. Place the TV set upside down.
4. Unscrew the four game unit set-screws from the TV set.  
Now the game unit can be detached from the TV set.

## REMOVAL OF CABINET (Continued)

### How to detach the game unit from the cabinet

1. Unscrew the eight top cabinet set-screws and remove the top cabinet.
2. Unscrew the eleven shielding case set-screws and the four chassis set-screws. Now the game PWB (PWB-D) can be drawn out.



## INSTALLATION AND SERVICE INSTRUCTIONS

- Note:** (1) When performing any adjustments to resistor controls and transformers use non-metallic screwdriver or TV alignment tools.
- (2) Before performing adjustment, TV set must be on at least 15 minutes.

### CIRCUIT PROTECTION

The receiver is protected by a 4.0A fuse (F701), mounted on PWB-A, wired into one side of the AC line input.

### X-RADIATION PROTECTOR CIRCUIT TEST

After service has been performed on the horizontal deflection system, high voltage system, or +B system, the X-Radiation protection circuit must be tested for proper operation as follows:

1. Apply 120V AC using a variac transformer for accurate input voltage.
2. Allow for warm up and adjust all customer controls for normal picture and sound.
3. Check the voltage of test point TP601. (It's voltage should be about 18V DC.)
4. Connect the pin (6) of IC501 to TP601 through a short clip lead.  
In this case, the operation of horizontal oscillator is stopped.
5. To start operation, remove the above short clip lead and touch the TP602 to chassis ground (TP603) with a short clip lead. In this case remove short clip lead as soon as the set operates again with a normal picture.
6. Connect TP651 to TP652 and see that the operation of horizontal oscillator then stops. Next, make sure that the set operates with a normal picture by the method of Step 5.
7. If the operation of the horizontal osc. does not stop in steps 4 and 6, the circuit must be repaired before the set is returned to the customer.

### HIGH VOLTAGE CHECK

High voltage is not adjustable but must be checked to verify that the receiver is operating within safe and efficient design limitations as specified checks should be as follows:

1. Connect an accurate high voltage meter to the CRT anode.
2. Operate receiver for at least 15 minutes at 120V AC line voltage, with strong air signal or a properly tuned in test signal.
3. Set SW851 on PWB-B to "OFF" (center) position.  
Note that loss of luminance will occur.
4. Rotate Screen control (on T652) to minimum (CCW) end of its rotation.
5. The reading should be approximately 26.5kV at zero beam.

If a correct reading cannot be obtained, check circuitry for malfunctioning components. Upon completion of voltage check, readjust screen control for proper operation and set SW851 to "ON" position.

# INSTALLATION AND SERVICE INSTRUCTIONS

## (Continued)

### FIELD ADJUSTMENT

#### ■ RF-AGC ADJUSTMENT

1. Select a local channel.
2. Turn *RF-AGC* control (R214) fully clockwise. As a result noise appears on picture, then slowly turn the *RF-AGC* control (R214) counterclockwise until noise disappears.
3. Check that no noise appears on other channels.

**NOTE 1:** All field adjustments mentioned can be performed without test equipment.

**NOTE 2:** As this model has "Built in AFT", AFT is always in "ON" position. If AFT should be "OFF", short between TP1003 and TP1004.

**NOTE 3:** After servicing the set, check that the aging switch SW1801 is set at "OFF" position. This aging switch is to be used only for the factory inspection; at "ON" position, it won't allow the set to be turned off.

#### ■ SUB-BRIGHTNESS CONTROL

1. Select a local channel.
2. Turn *Picture* control (a part of R462) fully clockwise and set *Brightness* control (a part of R462) at the center position.
3. Turn *Sub-Brightness* control (a part of R462) to obtain normal brightness of the picture.

#### ■ HORIZONTAL CENTERING

1. Select a local channel.
2. Adjust the Horizontal Centering Switch (SW751) on PWB-C to best picture position.

#### ■ VERTICAL SIZE ADJUSTMENT

1. Select a local channel.
2. Turn fully counterclockwise the *Brightness* and *Picture* controls to dim screen (in the state where the top and bottom of picture can be recognized.)
3. Adjust *Vertical Size* control (a part of R462) for approximately 1/8 to 1/4 inch over-scan at top and bottom of picture screen.

#### ■ FOCUS ADJUSTMENT

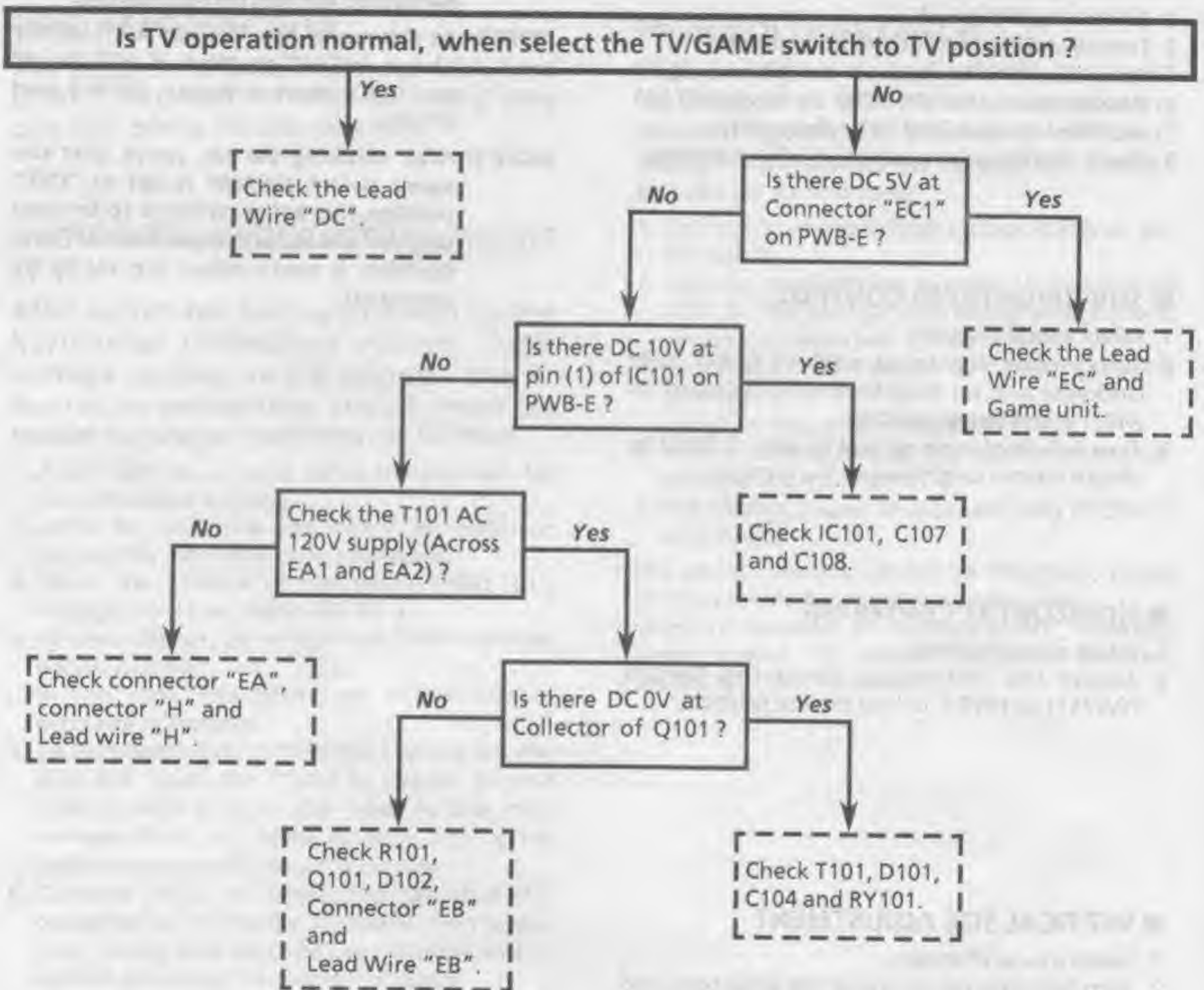
1. Select a local channel.
2. Set *Brightness* and *Picture* controls at a normal viewing level.
3. Adjust *Focus* control (part of T652) for sharp scanning lines and/or sharp picture.



## TROUBLE SHOOTING TABLE

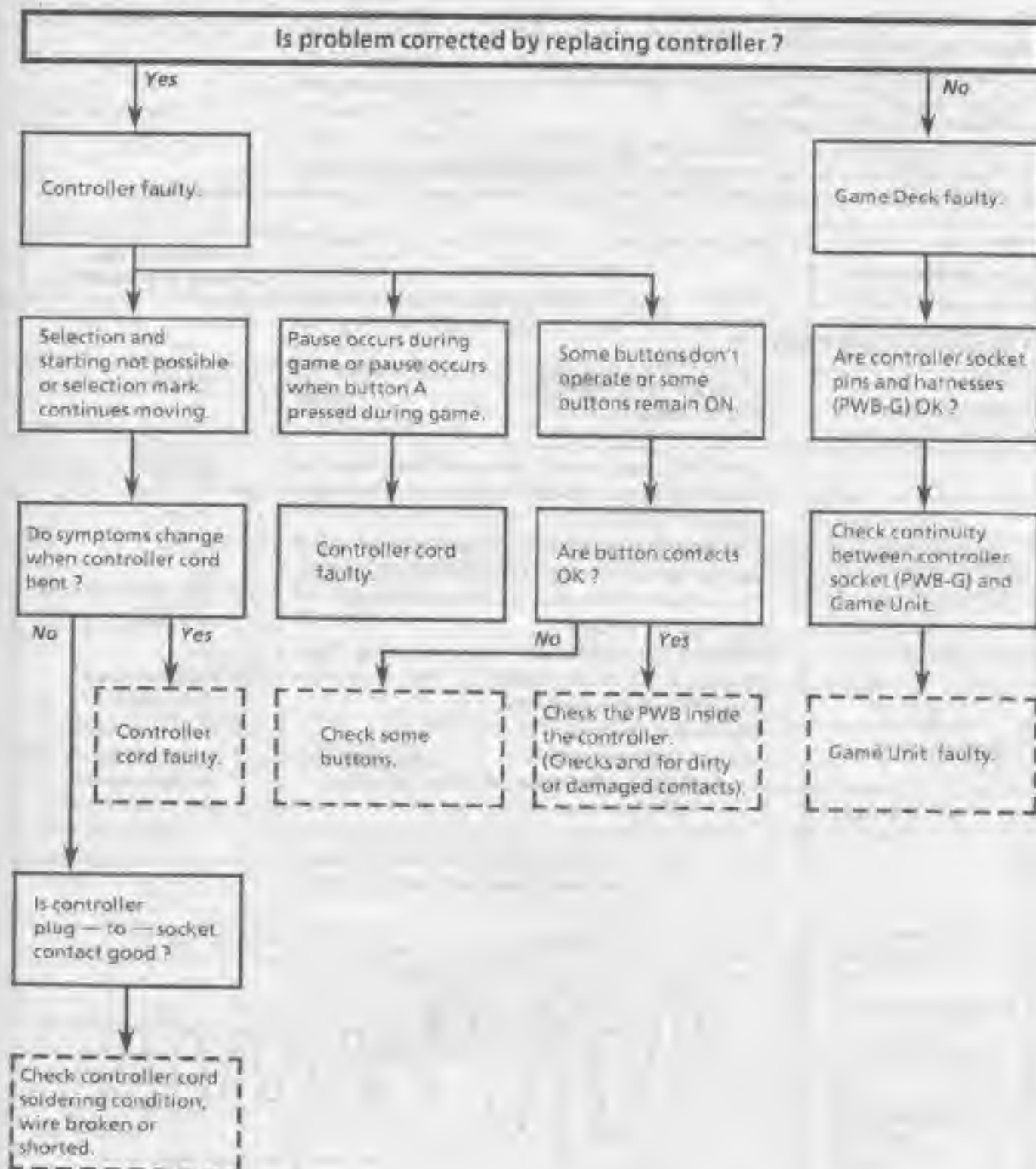
## Malfunctions not Traceable to Game Deck

## Display Fails to Appear (only noise)



## TROUBLE SHOOTING TABLE (Continued)

## Controller Does't Function.



## TROUBLE SHOOTING TABLE (Continued)

### Malfunctions Traceable to Game Deck

**\* Prior to replacing parts:**

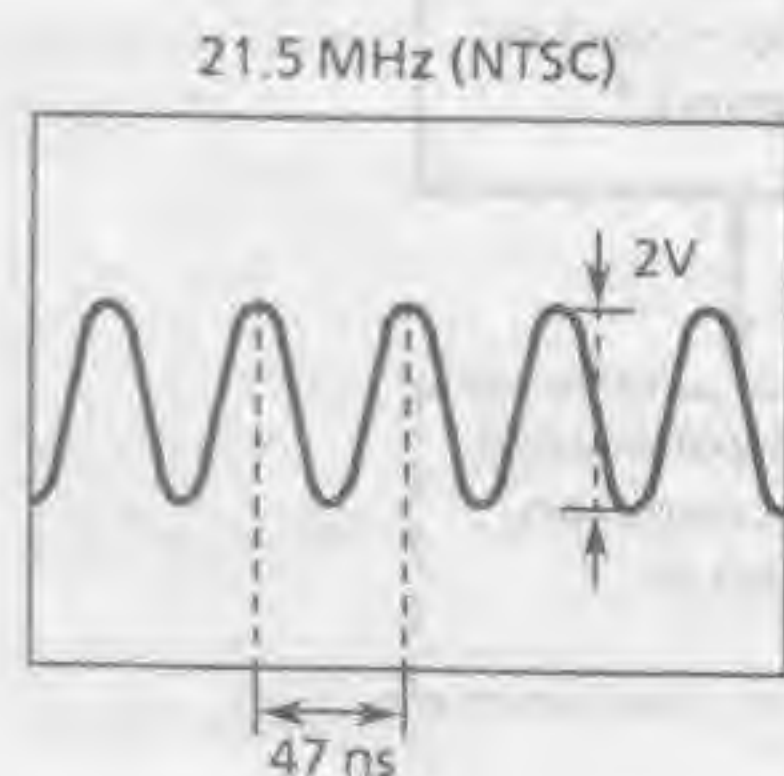
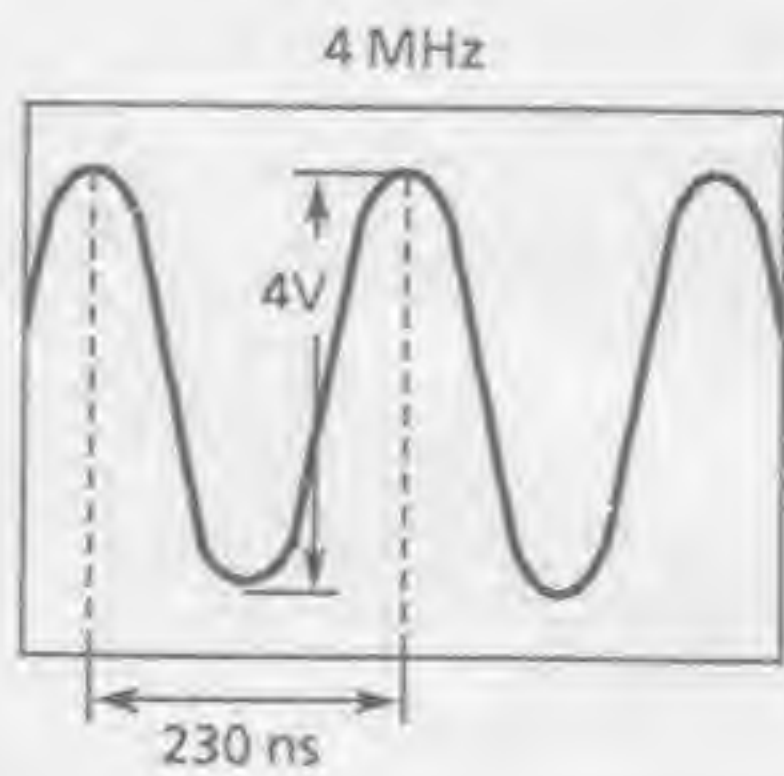
Check the following items before referring to the tables on the following pages and repairing the Game Unit.

1. Check the contact condition of card connector 72P.
2. Check the soldering of all parts.
3. Visually inspect for short circuits.
4. Check that all parts are mounted correctly.
5. Check for ICs that heat up abnormally while power is on (other than IC5 PPU).
6. Check for splitting or cracks in the resistor arrays, ceramic capacitors, ceramic oscillators, etc.

Symptom	Repair Procedure	Location of Fault (in order of probability)
---------	------------------	--

### Display in One Color

Sound normal.	1. Check for faulty soldering. IC5 PPU faulty.	(1) IC5 PPU
Sound normal.	<ol style="list-style-type: none"> <li>1. Check for faulty parts or faulty soldering near the crystal oscillators (labeled X1 and X2 on the Game Unit).</li> <li>2. Measure the oscillation frequency and input voltage at IC6 CPU pin (29) and IC5 PPU pin (18). The oscillation frequency should be 21.5 MHz. (see diagram below).</li> <li>3. Measure the oscillation frequency and input voltage at IC10 CIC pin (6). The oscillation frequency should be 4 MHz. (see diagram below).</li> <li>4. Check soldering for IC6 CPU, IC1 S-RAM and IC3. Faulty IC6 CPU, IC1 S-RAM, IC5 PPU, IC3 or IC9.</li> </ol>	<ol style="list-style-type: none"> <li>(1) IC6 CPU</li> <li>(2) IC1 S-RAM</li> <li>(3) IC5 PPU</li> <li>(4) X1, X2</li> <li>(5) IC3</li> <li>(6) IC7, IC8</li> <li>(7) MP1, MP2</li> <li>(8) IC9</li> <li>(9) Card connector "DE" 72P</li> <li>(10) Faulty soldering or a break in the conductor pattern.</li> </ol>



## TROUBLE SHOOTING TABLE (Continued)

Symptom	Repair Procedure	Location of Fault (in order of probability)
---------	------------------	--

## Display Black

Sound normal.	<ol style="list-style-type: none"> <li>1. Make sure that picture signal is being output from IC5 PPU pin (21).</li> <li>2. Make sure that soldering for Q1, FC2, Q4, L1, R23 and R2 is secure.</li> <li>3. Check for other faulty soldering or breaks in the conductor pattern.</li> </ol>	<ol style="list-style-type: none"> <li>(1) IC5 PPU</li> <li>(2) Faulty soldering or a break in the conductor pattern.</li> </ol>
No sound.	<ol style="list-style-type: none"> <li>1. Is there faulty soldering or a faulty part in the oscillation circuit (near X1, Q2 or Q3)?</li> <li>2. Are oscillation frequencies and input voltage levels of IC6 CPU pin (29) and IC5 PPU pin (18) normal? Faulty soldering or a break in the conductor pattern.</li> </ol>	<ol style="list-style-type: none"> <li>(1) X1</li> <li>(2) Faulty soldering or a break in the conductor pattern.</li> <li>(3) IC10</li> </ol>

## Display Flashes

Display repeatedly appears and dies.	<ol style="list-style-type: none"> <li>1. Is the Game Pack normal? Is it installed correctly?</li> <li>2. Is there any faulty soldering or a break in the conductor pattern?</li> <li>3. Is IC10 faulty? IC9 faulty.</li> </ol>	<ol style="list-style-type: none"> <li>(1) IC10</li> <li>(2) Card connector "DE" 72P</li> <li>(3) Faulty soldering or a break in the conductor pattern.</li> <li>(4) IC9</li> </ol>
--------------------------------------	---	---

## Normal Display Doesn't Appear

Abnormality occurs after playing the game for a long time.	<ol style="list-style-type: none"> <li>1. Heat up IC5 PPU using a hair dryer or the like. If faulty symptoms appear, then the PPU is faulty.</li> <li>2. Heat up IC6 CPU using a hair dryer or the like. If faulty symptoms appear, then the CPU is faulty.</li> </ol>	<ol style="list-style-type: none"> <li>(1) IC5 PPU</li> <li>(2) IC6 CPU</li> </ol>
Moving characters OK, But non-moving characters and background abnormal.	<ol style="list-style-type: none"> <li>1. Is there faulty soldering or a break in the conductor pattern in or near IC4 S-RAM, IC2, IC9 HC139 or card connector "DE" 72P?</li> <li>2. Is IC4 S-RAM, IC2, IC9 HCU04P or IC5 PPU faulty? Card connector "DE" 72P faulty.</li> </ol>	<ol style="list-style-type: none"> <li>(1) IC4 S-RAM</li> <li>(2) IC2</li> <li>(3) Faulty soldering or a break in the conductor pattern.</li> <li>(4) IC9</li> <li>(5) Card connector "DE" 72P</li> <li>(6) IC5 PPU</li> </ol>

## TROUBLE SHOOTING TABLE (Continued)

Symptom	Repair Procedure	Location of Fault (in order of probability)
---------	------------------	--

### Normal Display Doesn't Appear

<p>Poor or no color in picture.</p>	<p>1. Check soldering and make sure that the correct parts are mounted and that they are mounted in the correct direction near resistor R2 and in the oscillator circuit (the area containing X1, Q2 and Q3). Adjust trimmer capacitor C50 and match to normal chroma frequency.</p>	<p>(1) Misadjusted C50 trimmer capacitor. (2) Faulty soldering or erroneous mounting. (3) X1 (4) IC5 PPU</p>
-------------------------------------	--	--

### Normal Display, But Operation Via Controller Not Possible

<p>Game Select symbol does not appear, or is shaped abnormally if it does appear.</p>	<p>1. Is IC5 PPU faulty? Faulty IC6 CPU.</p>	<p>(1) IC5 PPU (2) IC6 CPU</p>
<p>Game Select symbol keeps moving.</p>	<p>1. Is there faulty soldering or a break in the conductor Pattern in MP1 or MP2? 2. Is there faulty soldering or a break in the conductor Pattern in IC7 or IC6 CPU? Faulty IC7 or IC6 CPU.</p>	<p>(1) MP1, MP2 (2) C7 (3) IC6 CPU</p>
<p>Controller I is inoperable (Game Select not possible).</p>	<p>1. Is the controller harness securely connected? 2. Is there faulty soldering or a break in the conductor Pattern near IC7 or IC6 CPU? Faulty IC7 or IC6 CPU.</p>	<p>(1) IC7 (2) Faulty soldering or a break in the conductor pattern. (3) IC6 CPU (4) MP1, MP2</p>
<p>Controller II is inoperable</p>	<p>1. Is the controller harness securely connected? 2. Is there faulty soldering or a break in the conductor Pattern near IC8 or IC6 CPU? Faulty IC8 or IC6 CPU.</p>	<p>(1) IC8 (2) Faulty soldering or a break in the conductor pattern. (3) IC6 CPU (4) MP1, MP2</p>

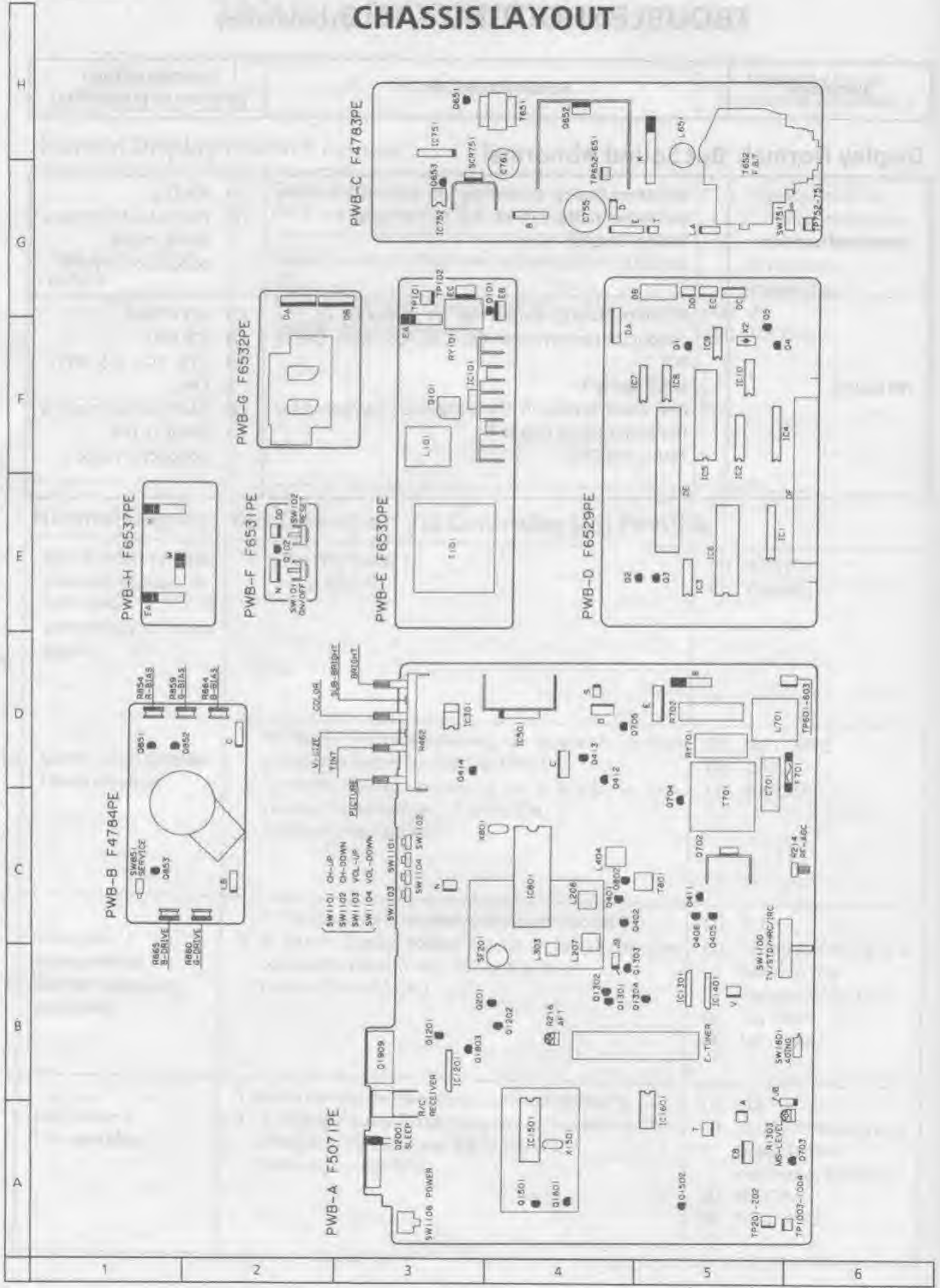
## TROUBLE SHOOTING TABLE (Continued)

Symptom	Repair Procedure	Location of Fault (in order of probability)
---------	------------------	--

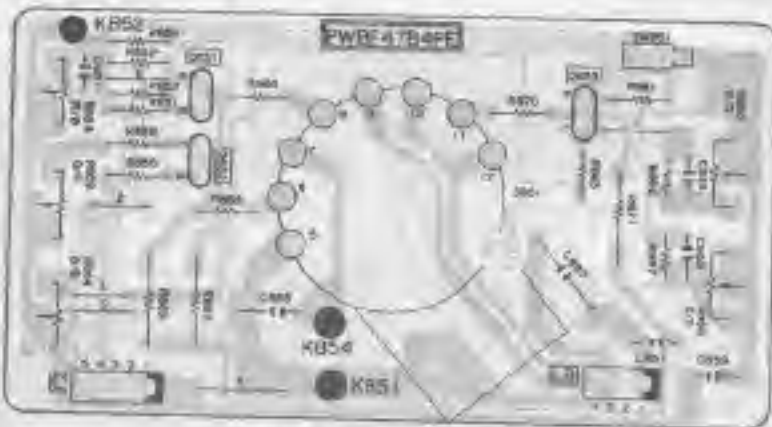
### Display Normal, But Sound Abnormal

Abnormal melody.	1. Is there faulty soldering or a break in the conductor pattern in R3, R4, R6, R7 or R8? Faulty IC6 CPU.	(1) IC6 CPU (2) Faulty soldering or a break in the conductor pattern.
No sound.	1. Is there faulty soldering or a break in the conductor pattern near IC9, C23, Q5, R21, C48 or FC1? 2. Is IC9 faulty? 3. Are there breaks in the conductor pattern near the audio signal circuit? 4. Faulty IC6 CPU.	(1) IC9 HCU04 (2) IC6 CPU (3) C23, FC1, Q5, R21, C48 (4) Faulty soldering or a break in the conductor pattern.

# CHASSIS LAYOUT



# PRINTED WIRING BOARD ASSEMBLIES



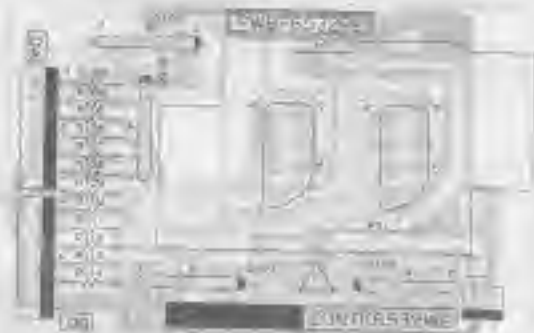
PWB-B Wiring Side



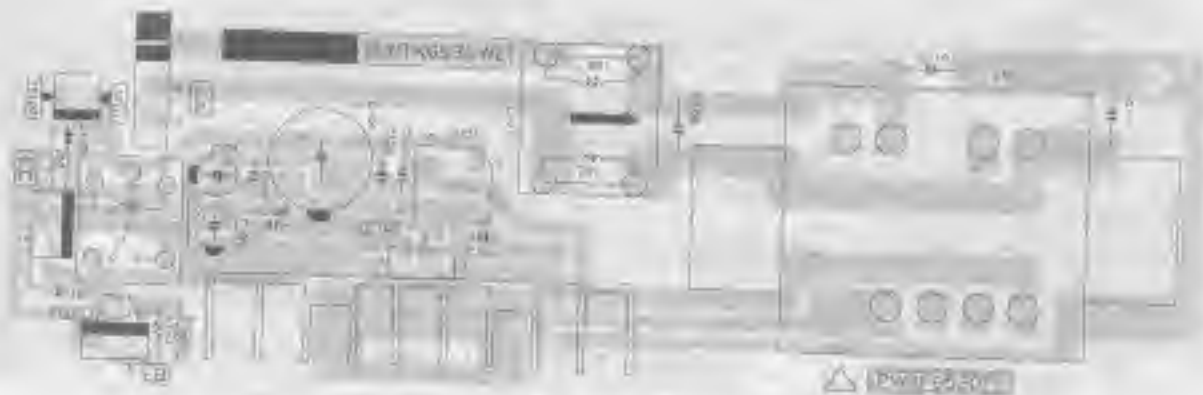
PWB-H Wiring Side



PWB-F Wiring Side



PWB-G Wiring Side

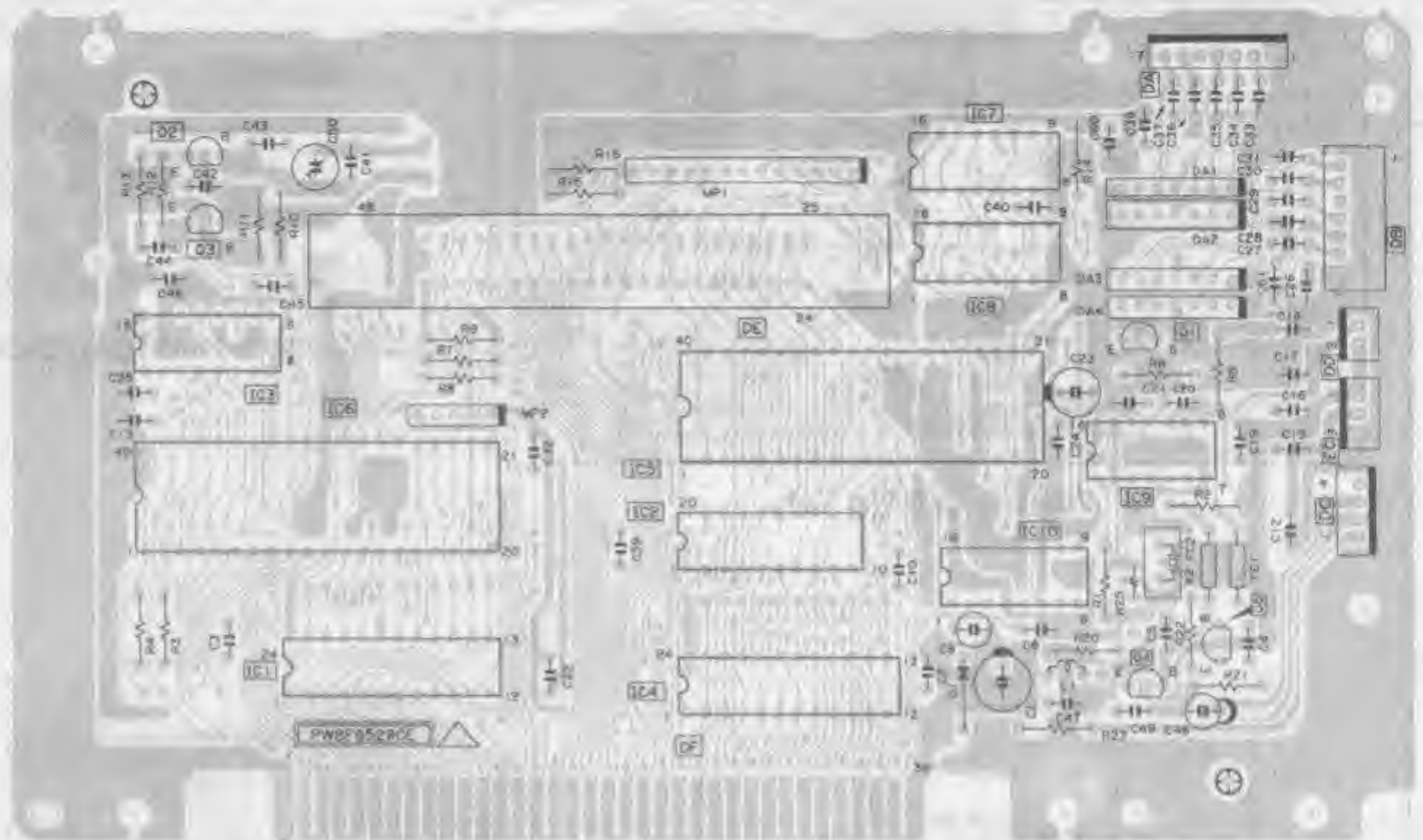


PWB-E Wiring Side

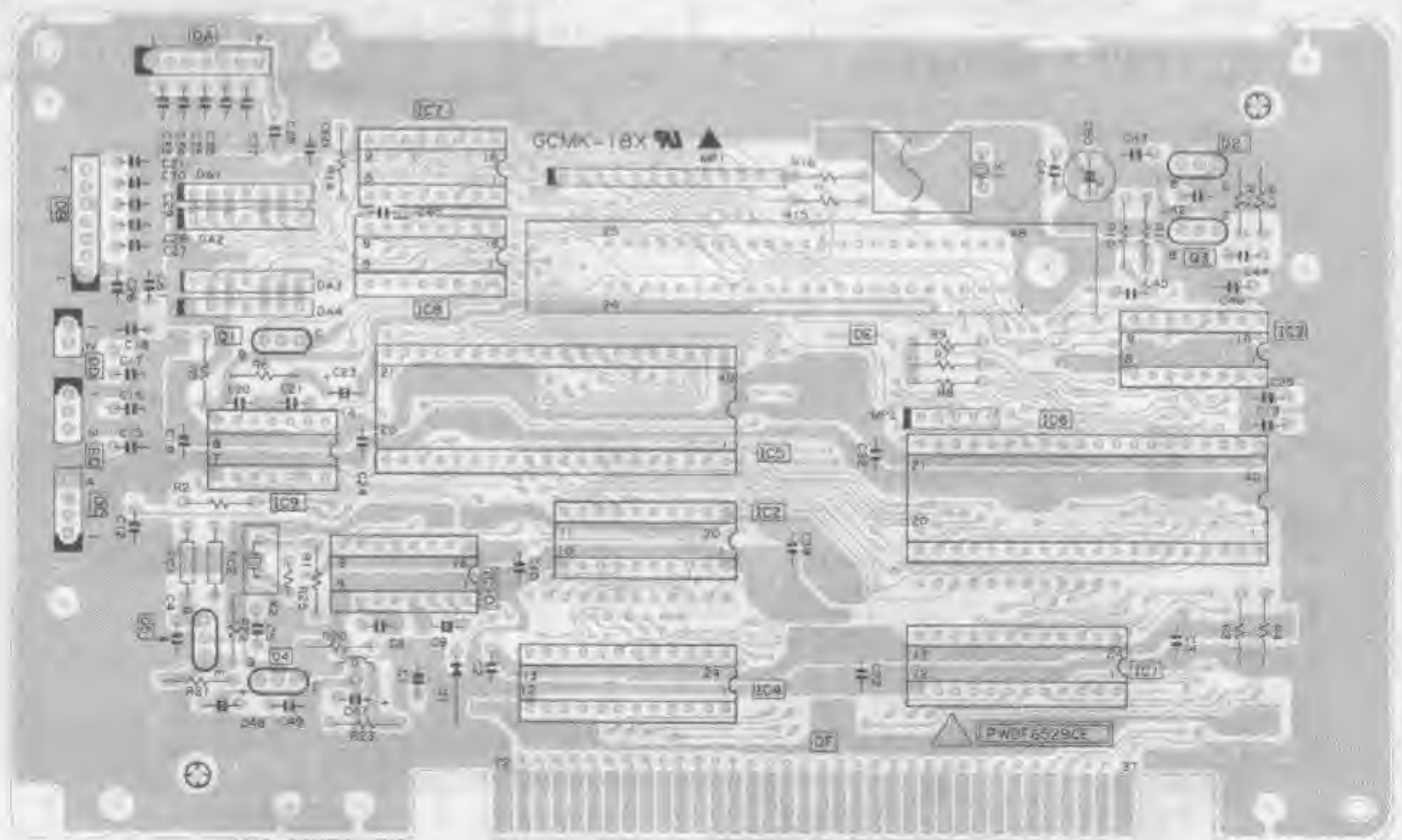


PRINTED WIRING BOARD ASSEMBLIES (Continued)

H  
G  
F  
E  
D  
C  
B  
A



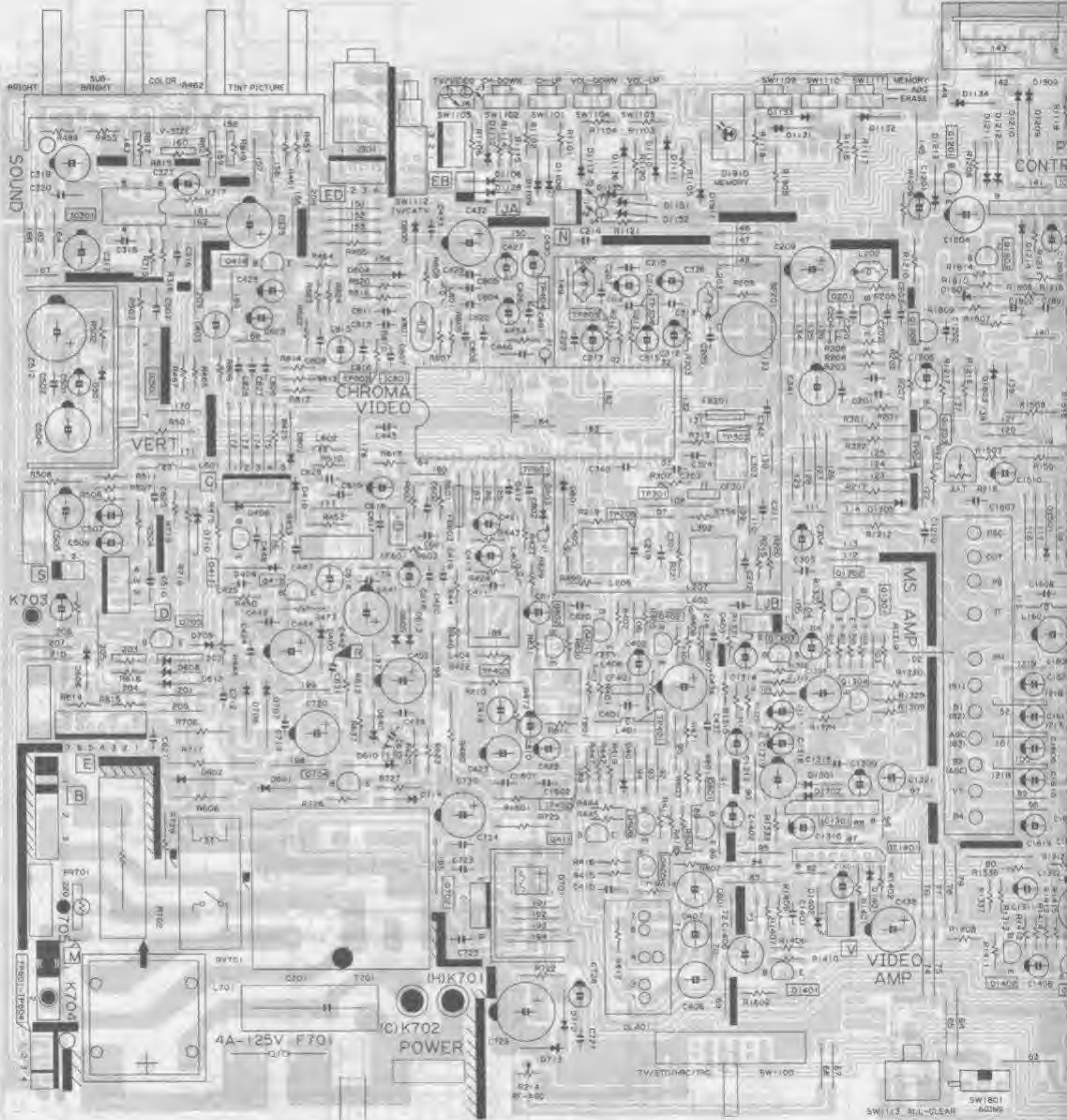
PWB-D Parts Side



PWB-D Solder Side

1 2 3 4 5 6

# PRINTED WIRING BOARD ASSEMBLIES (Continued)



PWB-A Wiring Side

1

2

3

4

5

6

7

## IMPORTANT SERVICE SAFETY PRECAUTION

- Service work should be performed only by qualified service technicians who are thoroughly familiar with all safety checks and servicing guidelines which follow:

### WARNING

1. For continued safety, no modification of any circuit should be attempted.
2. Disconnect AC power before servicing.
3. Semiconductor heat sinks are potential shock hazards when the receiver is operating.
4. The chassis in this receiver has two ground systems which are separated by insulation material. The non-isolated (hot) ground system is for the +B voltage regulator circuit and the horizontal output circuit. The isolated ground system is for the low +B DC voltages and the secondary circuit of the high voltage transformer.

To prevent electrical shock use an isolation transformer between the line cord and power receptacle, when servicing this chassis.

### SERVICING OF HIGH VOLTAGE SYSTEM AND PICTURE TUBE

When servicing the high voltage system, remove the static charge by connecting a 10k ohm resistor in series with an insulated wire (such as a test probe) between the picture tube ground and the anode lead. (AC cord should be disconnected from AC outlet.)

1. Note that the picture tube in this receiver employs integral implosion protection.
2. Replace with tube of the same type number for continued safety.
3. Do not lift picture tube by the neck.
4. Handle the picture tube only when wearing shatterproof goggles and after discharging the high voltage anode completely.

### X-RADIATION AND HIGH VOLTAGE LIMITS

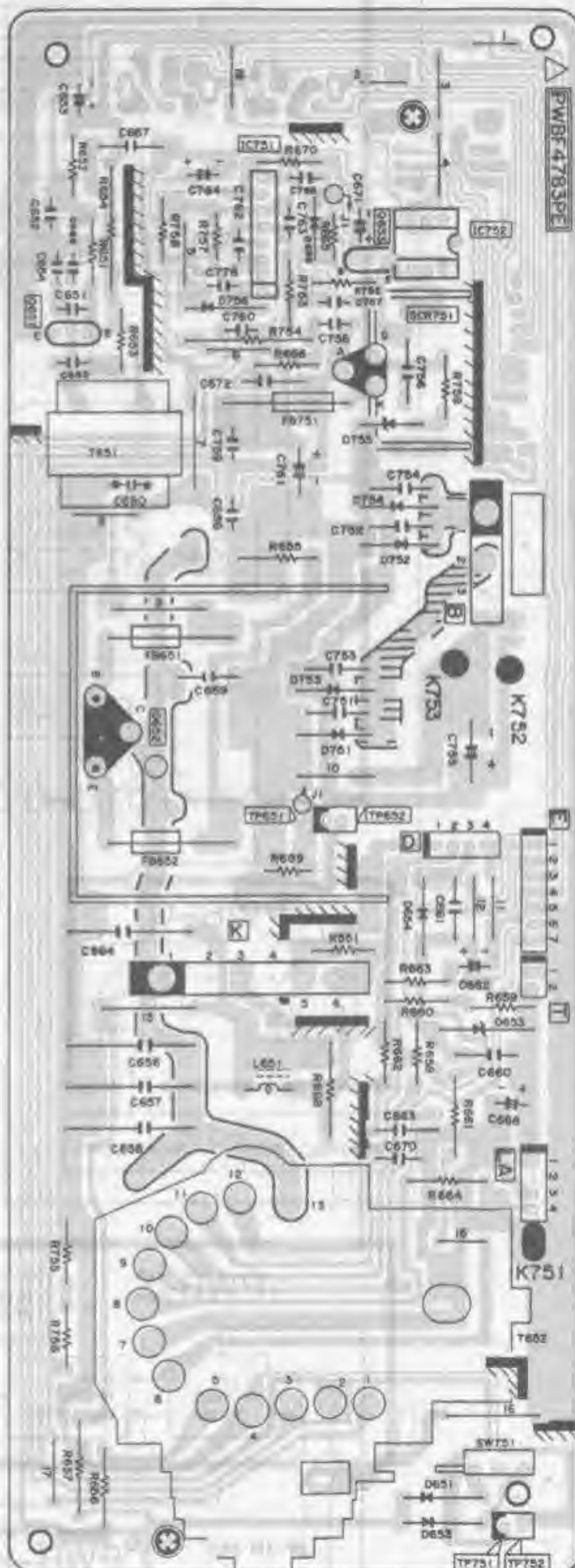
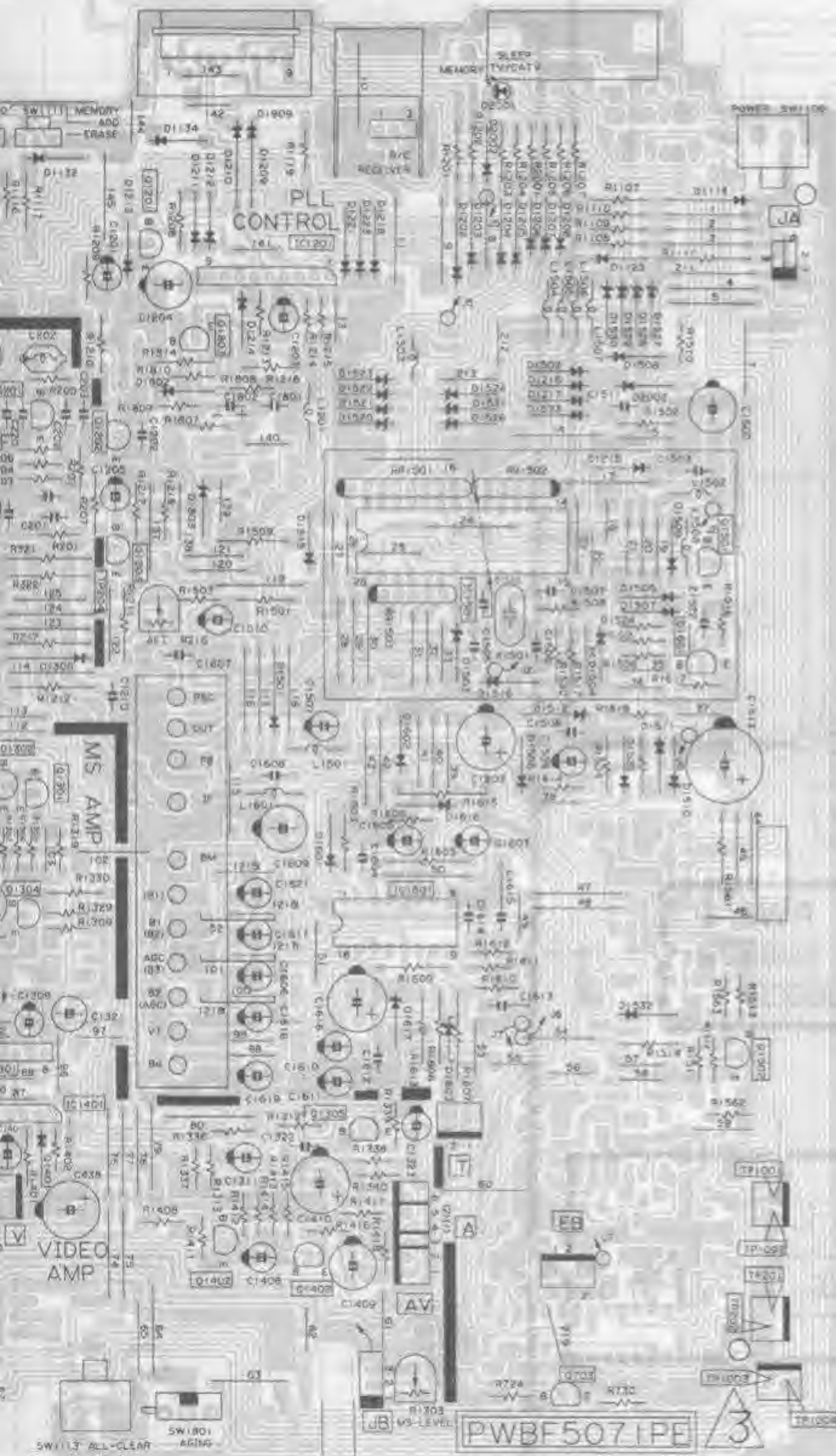
1. All service personnel should be aware of the procedures and instructions covering X-radiation. The only potential source of X-ray in current solid state TV receivers is the picture tube. However, the picture tube does not emit measurable X-Ray radiation if the high voltage is as specified in the "High Voltage Check" instructions. It is only when high voltage is excessive that X-radiation is capable of penetrating the picture tube shell which includes lead in glass material. The important precaution is to keep high voltage below the maximum level specified.

2. It is essential that servicemen have available at all times an accurate high voltage meter. The calibration of this meter should be checked periodically.
3. High voltage should always be kept at the rated value — no higher. Operation at higher voltages may cause a failure of the picture tube or high voltage circuitry and, under certain conditions, may produce radiation in excess of desirable levels.
4. When the high voltage regulator is operating properly there is no possibility of an X-radiation problem. Every time a color chassis is serviced, the brightness should be tested while monitoring high voltage with a meter to be certain that it does not exceed the specified value and is regulated correctly.
5. Do not use a picture tube other than that specified, and do not make unrecommended circuit modifications to the high voltage circuitry.
6. When trouble shooting and taking test measurements on a receiver with excessively high voltage, avoid being unnecessarily close to the receiver. Do not operate the receiver longer than is necessary to locate the cause of excessive voltage.

### FIRE AND SHOCK HAZARD CHECKS

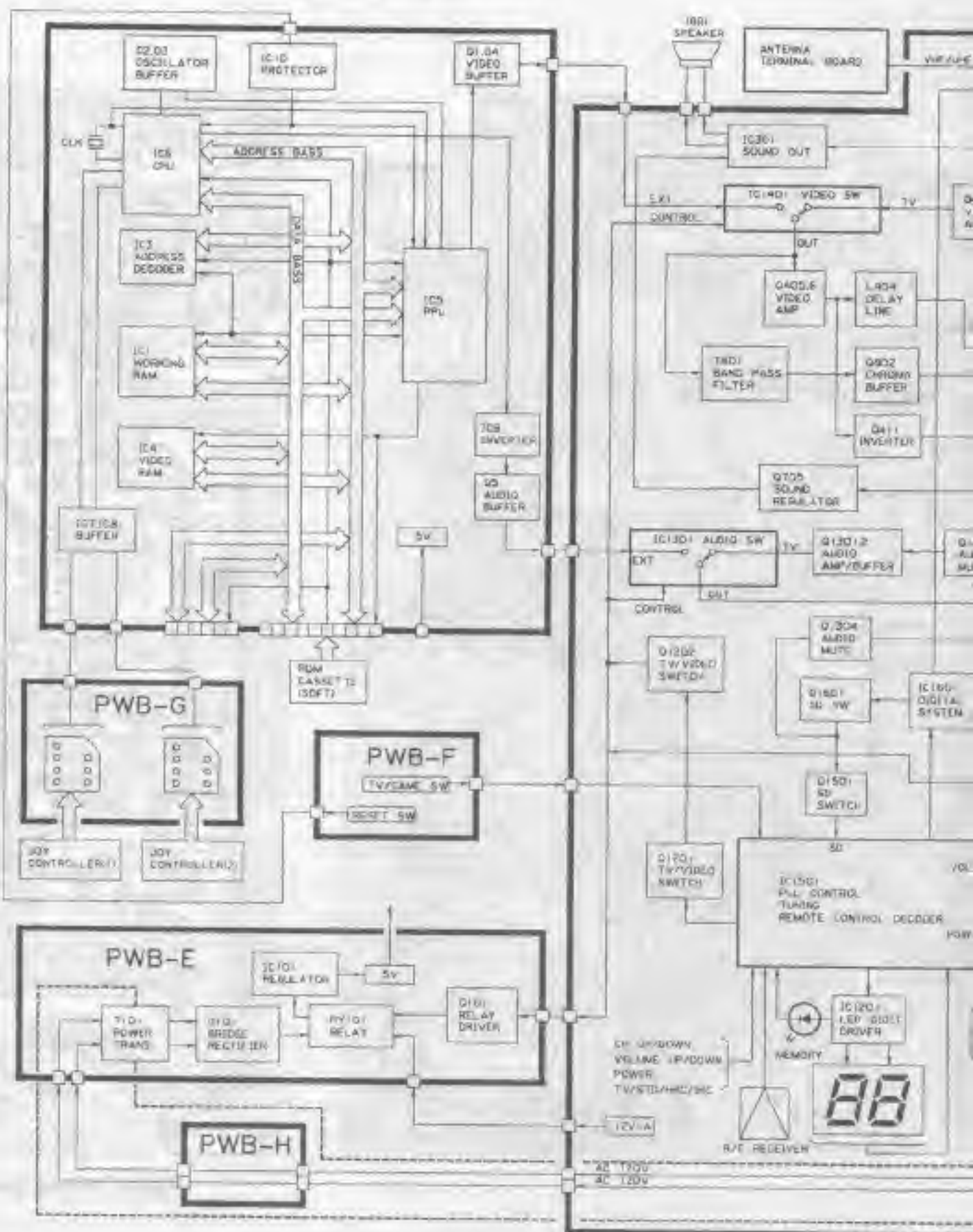
Before returning the receiver to the user, perform the following safety checks:

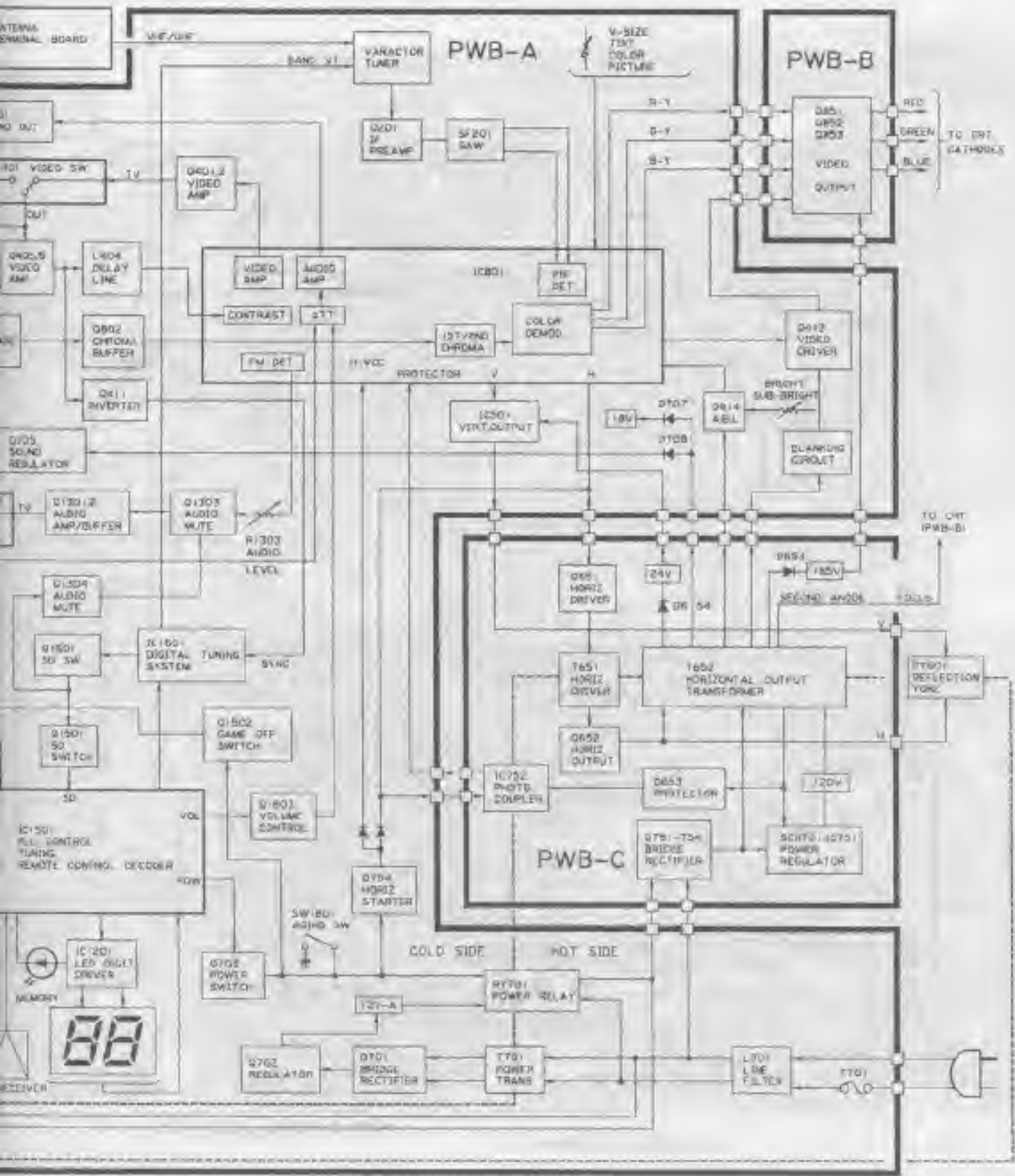
1. Inspect all lead dress to make certain that leads are not pinched, and check that hardware is not lodged between the chassis and other metal parts in the receiver.
2. Inspect all protective devices such as non-metallic control knobs, insulating materials, cabinet backs, adjustment and compartment covers or shields, isolation resistor-capacity networks, mechanical insulators, etc.
3. To be sure that no shock hazard exists, check for current leakage in the following manner:
  - Plug the AC cord directly into a 120 volt AC outlet, (Do not use an isolation transformer for this test).
  - Using two clip leads, connect a 1.5k ohm, 10 watt resistor paralleled by a 0.15 $\mu$ F capacitor in series with all exposed metal cabinet parts and a known earth ground, such as an electrical conduit or electrical ground connected to an earth ground.



PWB-C Wiring Side

# BLOCK DIAGRAM





5	7	8	9	10	11	12
---	---	---	---	----	----	----

# BLOCK DIAGRAM (Continued)

## IC1 and IC4: RH-iX1245CEZZ

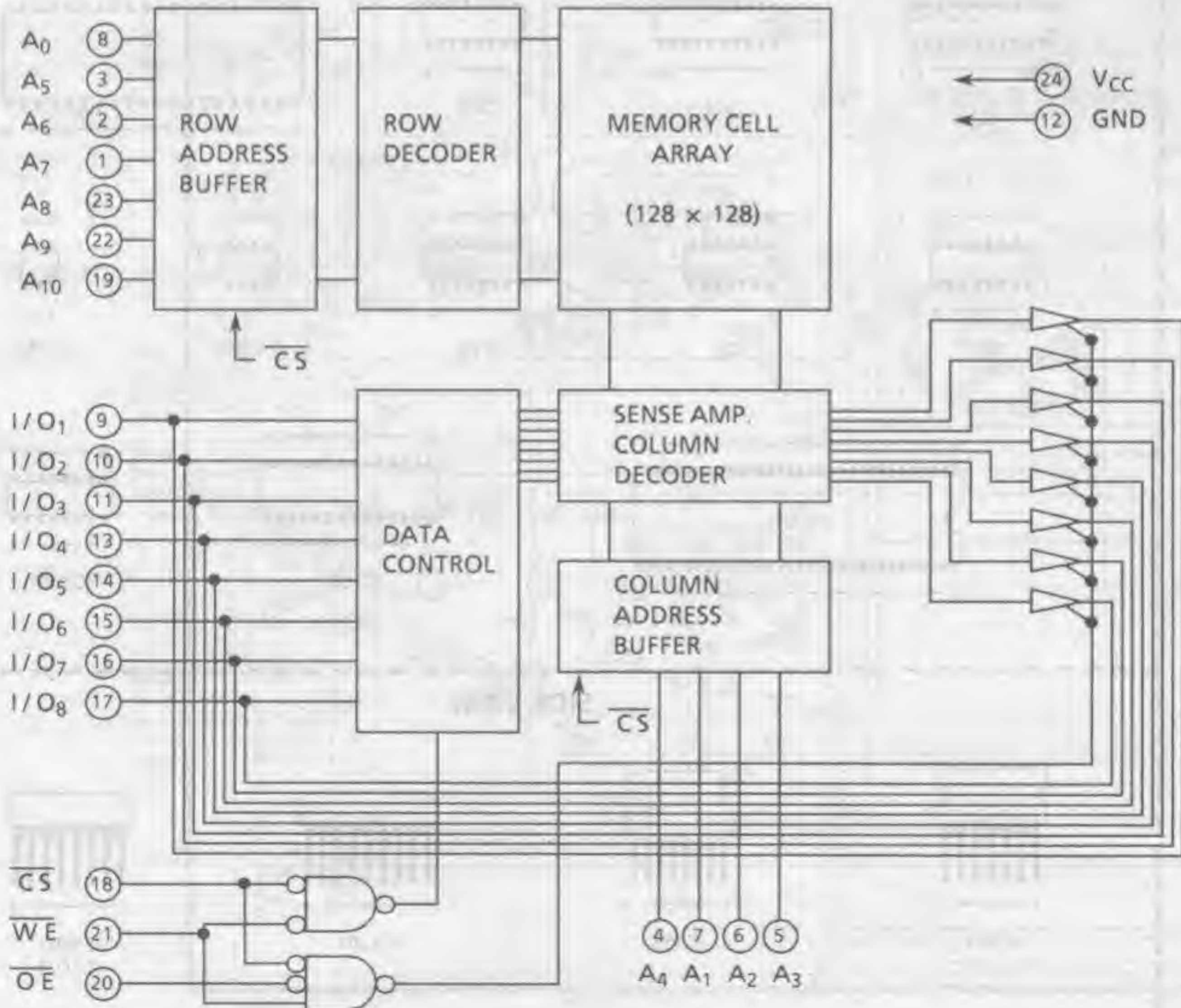
### PINS ARRANGEMENT

Pin	Function
A <sub>0</sub> ~ A <sub>1</sub>	Address Input
$\overline{CS}$	Chip Select
$\overline{OE}$	Output Enable
$\overline{WE}$	Write Enable
I/O <sub>1</sub> ~ I/O <sub>8</sub>	Data Input/Output
V <sub>CC</sub>	Power
GND	Ground



Output Control Input  
Output  
Data Input  
Output  
Data Input  
Output

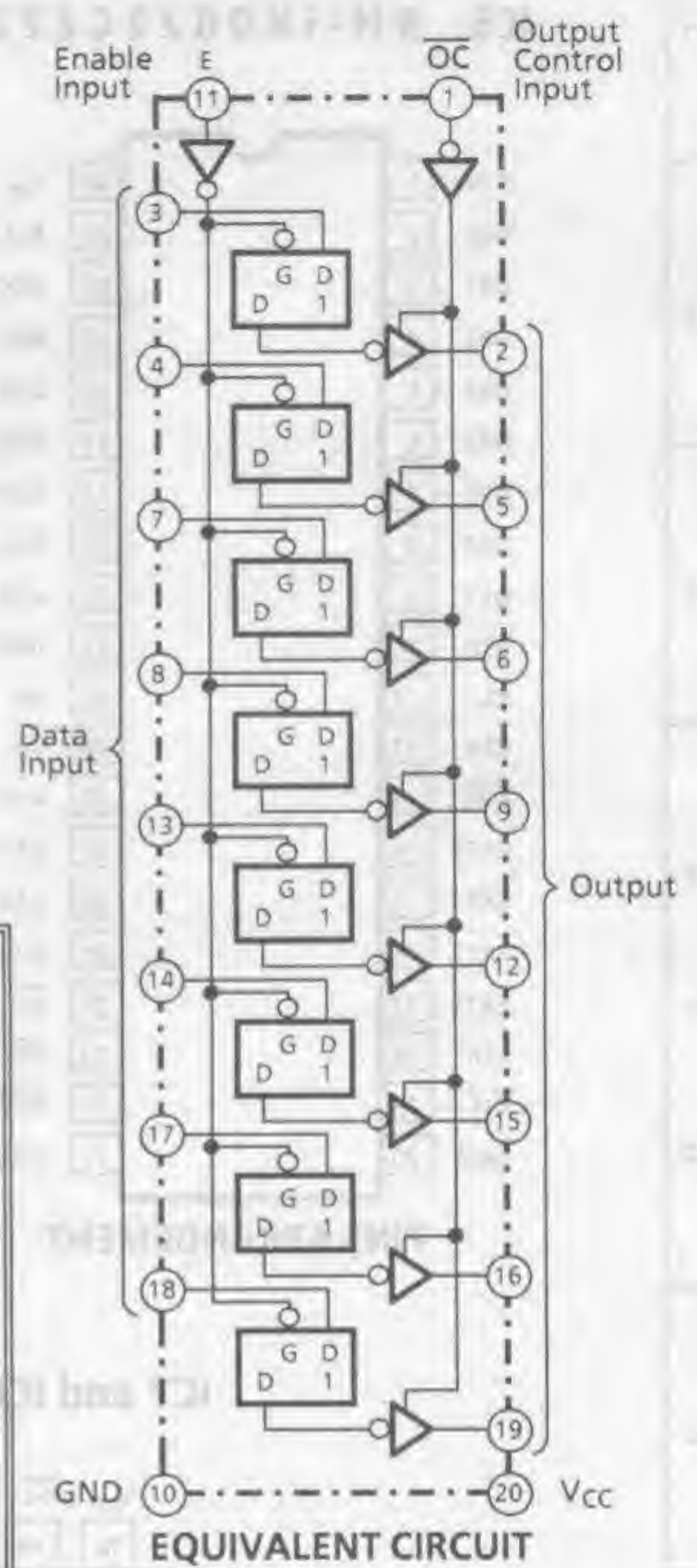
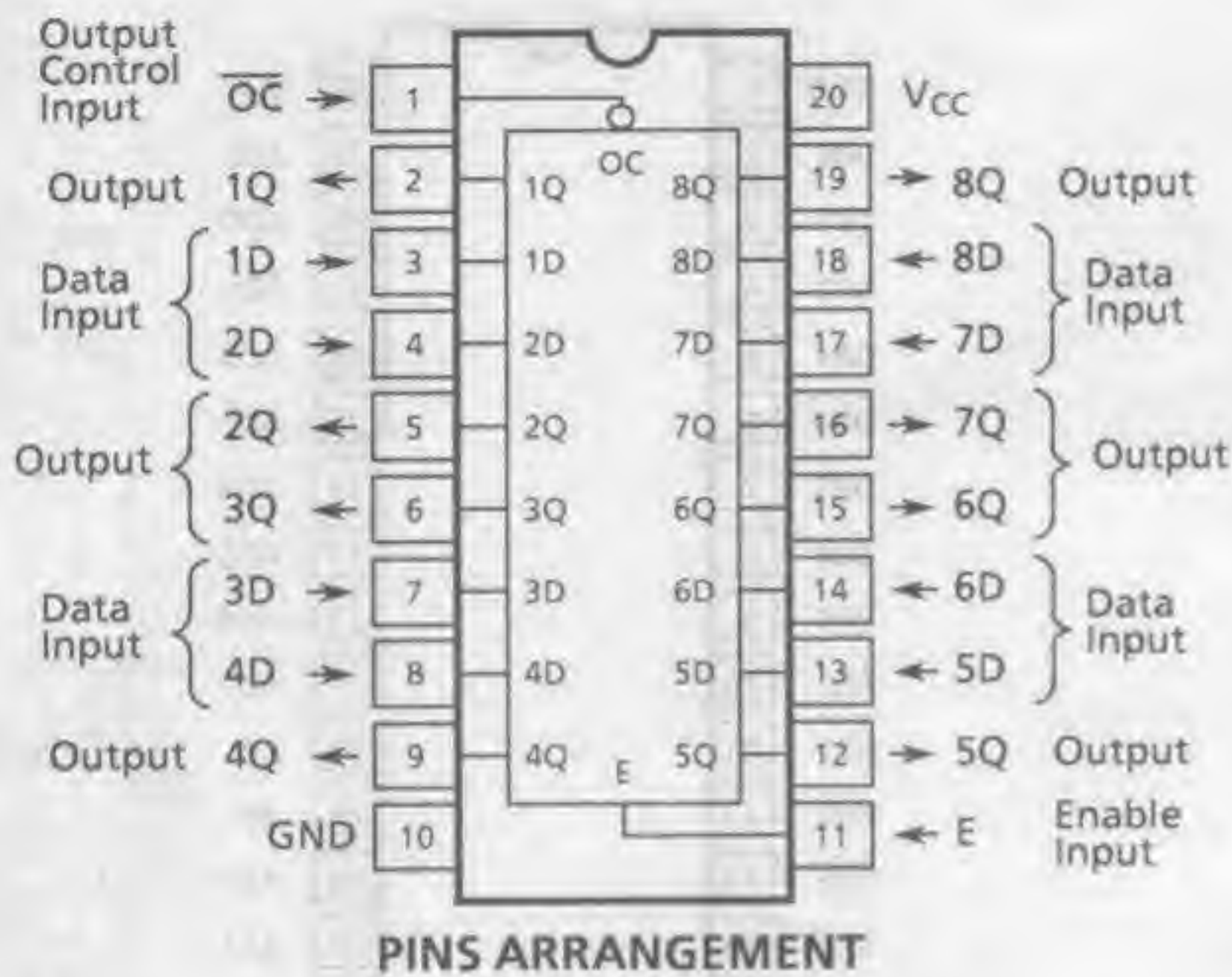
### BLOCK DIAGRAM



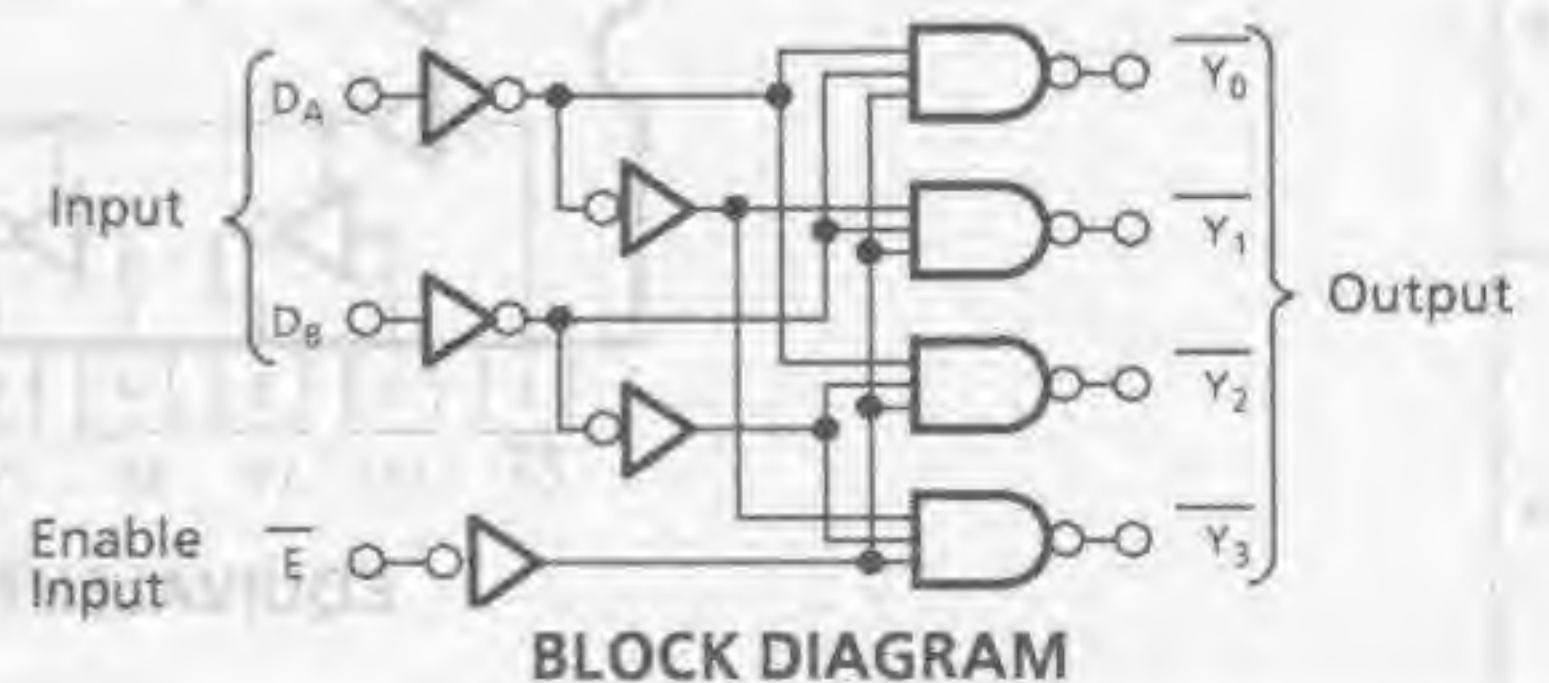
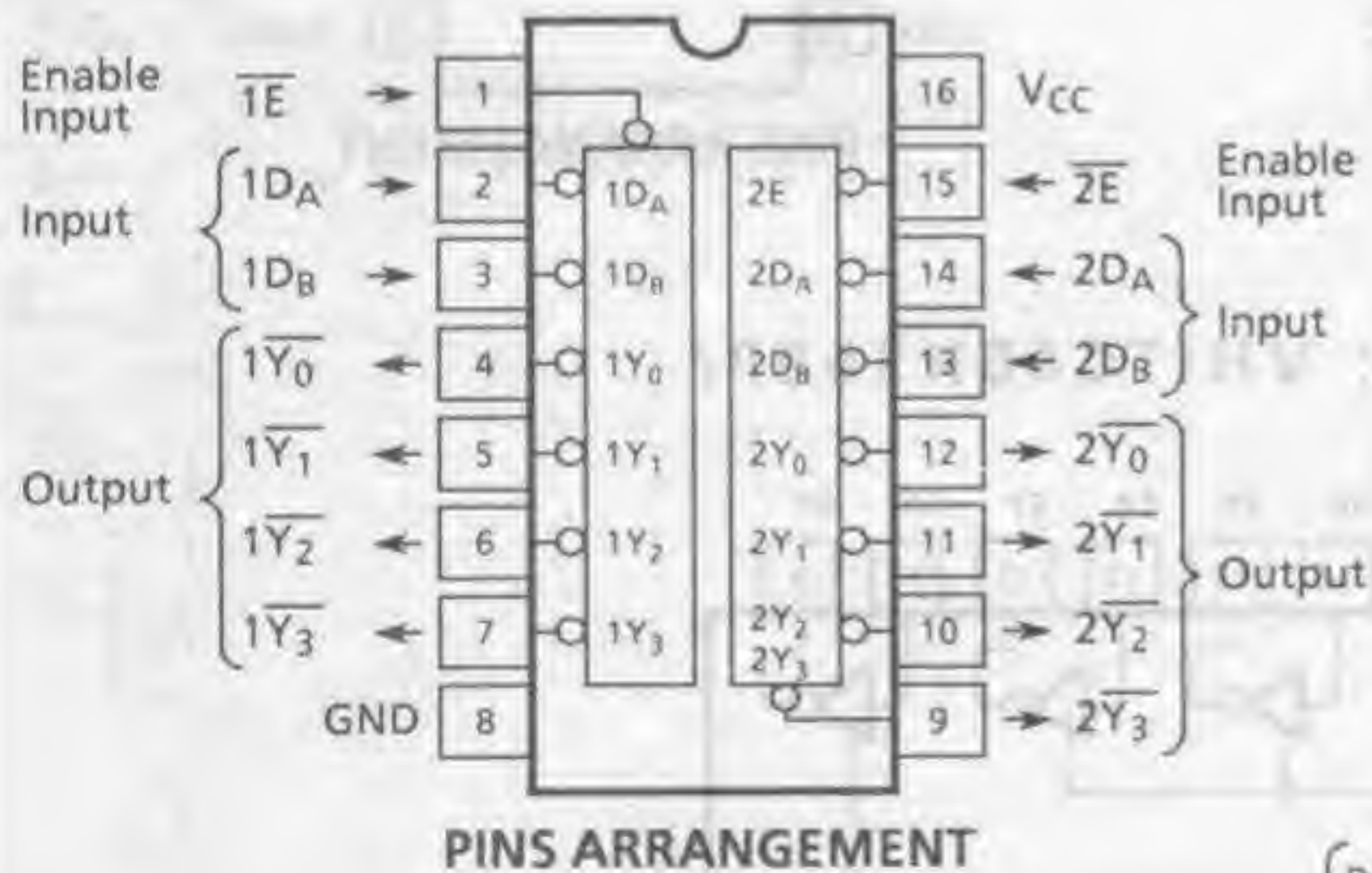
Enable Input  
Input  
Output

# BLOCK DIAGRAM (Continued)

**IC2: RH-iX0666CEZZ**



**IC3: RH-iX0341CEZZ**



CC  
8  
9  
E  
E  
10  
S  
O<sub>8</sub>  
O<sub>7</sub>  
O<sub>6</sub>  
O<sub>5</sub>  
O<sub>4</sub>

Vcc  
GND





## BLOCK DIAGRAM (Continued)

IC5: RH-iX0822CEZZ



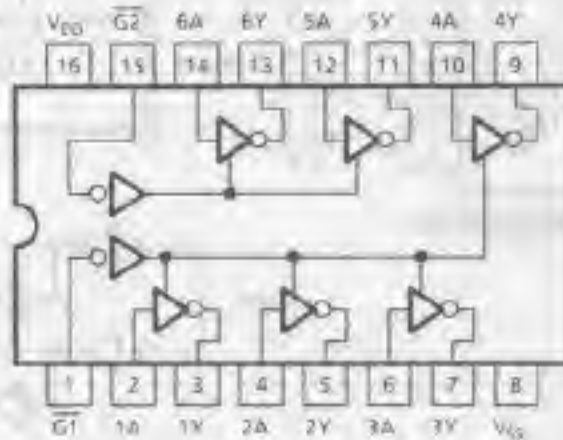
PINS ARRANGEMENT

IC6: RH-iX0821CEZZ



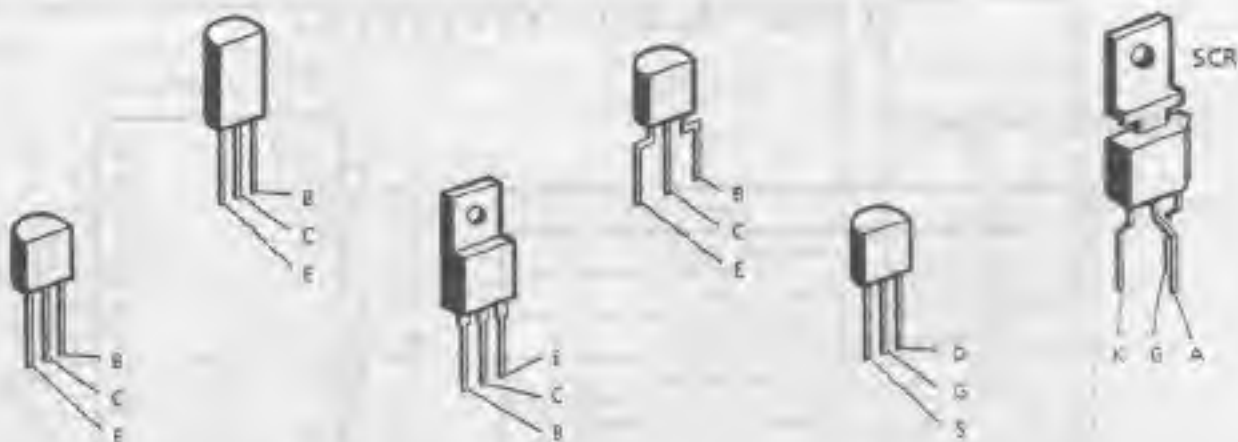
PINS ARRANGEMENT

IC7 and IC8: VHiTC40H368P/

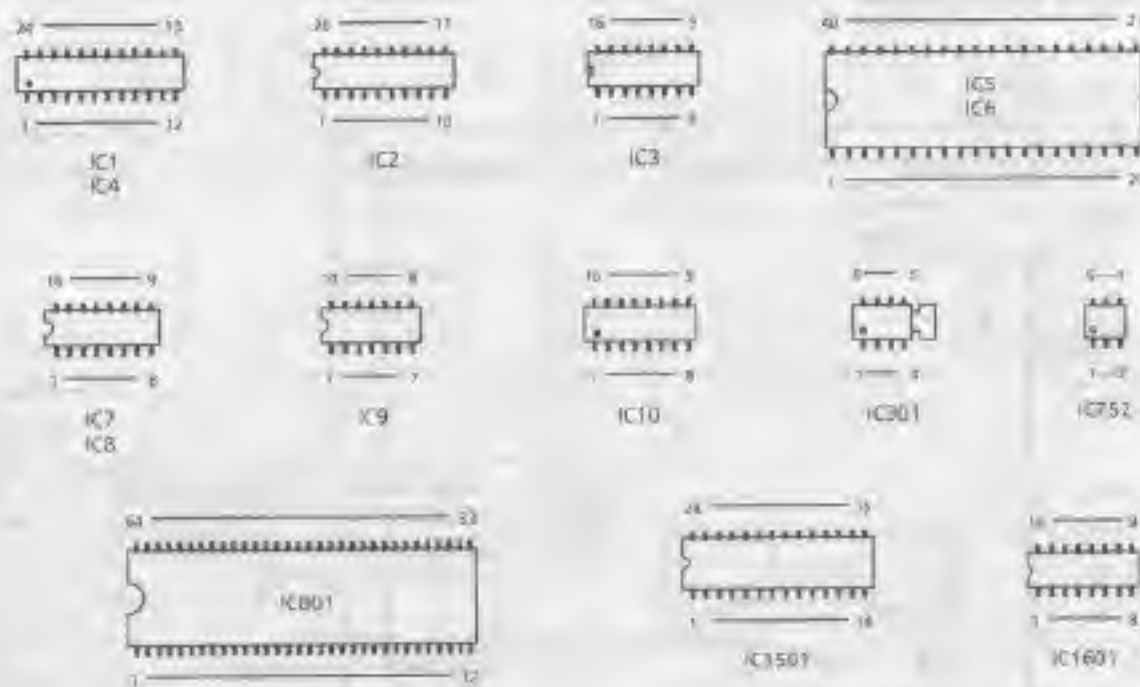


EQUIVALENT CIRCUIT

# SOLID STATE DEVICE BASE DIAGRAM



## TOP VIEW



## SIDE VIEW



# Memo

**NOTE:**

- 1. The un...
- M:1 M
- 2. All resi
- 3. All cap
- 4. (G) in
- 5.  $\frac{1}{2}$  ind
- 6.  $\nabla$  ind

**VOLTAGE**

- 1. All DC
- connec
- line v
- normal
- 2. All vol
- signal,

- $\triangle$  AM
- $\blacktriangle$  MA

This circ  
circuits  
improve

# DESCRIPTION OF SCHEMATIC DIAGRAM

**NOTE:**

1. The unit of resistance "ohm" is omitted (K:1000 ohms, M:1 Meg ohm).
2. All resistors are 1/8 watt, unless otherwise noted.
3. All capacitors are  $\mu F$ , unless otherwise noted P: $\mu F$ .
4. (G) indicates  $\pm 2\%$  tolerance may be used.
5.  $\perp$  indicates line isolated ground.
6.  $\nabla$  indicates hot ground.

**VOLTAGE MEASUREMENT CONDITIONS:**

1. All DC voltages are measured with AC voltmeter connected between points indicated and chassis ground, line voltage set at 120V AC and all controls set for normal picture unless otherwise indicated.
2. All voltages measured with 1000 $\mu V$  B & W or Color signal.

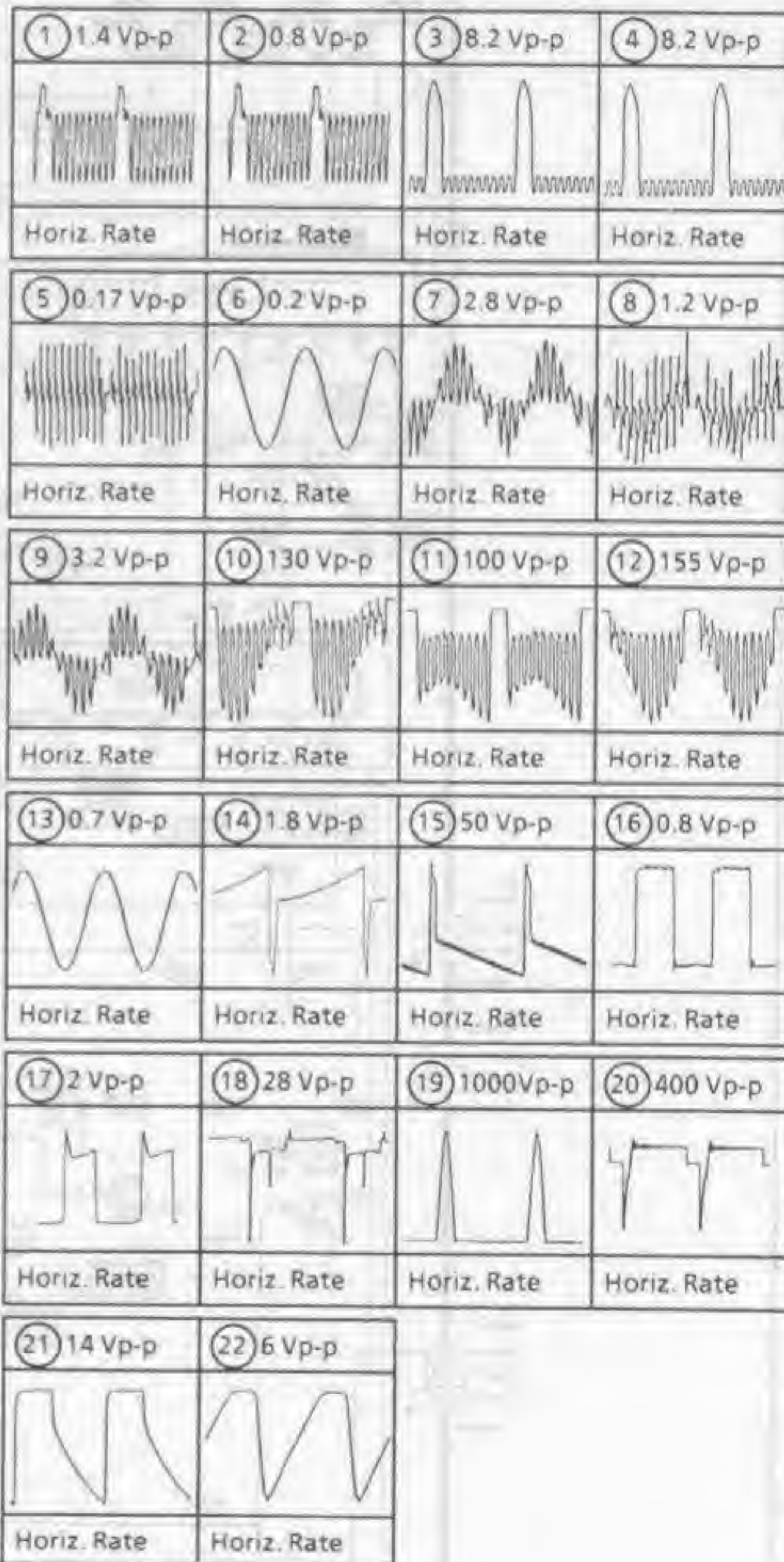
**▲ AND SHADED ( ) COMPONENTS = SAFETY RELATED PARTS.**  
**▲ MARK = X-RAY RELATED PARTS.**

This circuit diagram is a standard one, printed circuits may be subject to change for product improvement without prior notice.

## WAVEFORMS

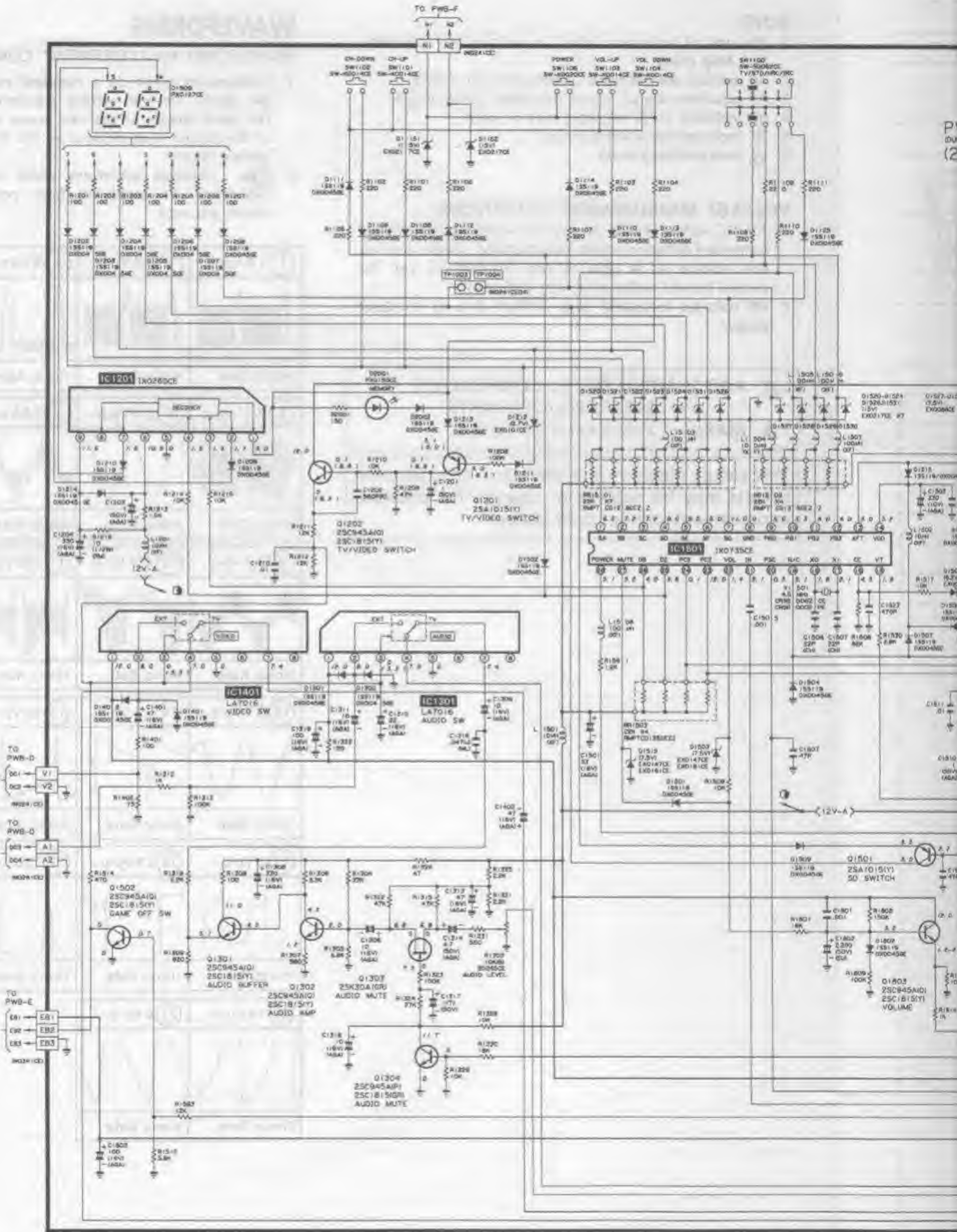
**WAVEFORM MEASUREMENT CONDITIONS:**

1. Photographs taken on a standard gated rainbow color bar signal, the tint setting adjusted for proper color. The wave shapes at the red, green and blue cathodes of the picture tube depend on the tint, color level and picture control.
2.  $\odot$  indicates waveform check points (See chart, waveforms are measured from point indicated to chassis ground.)



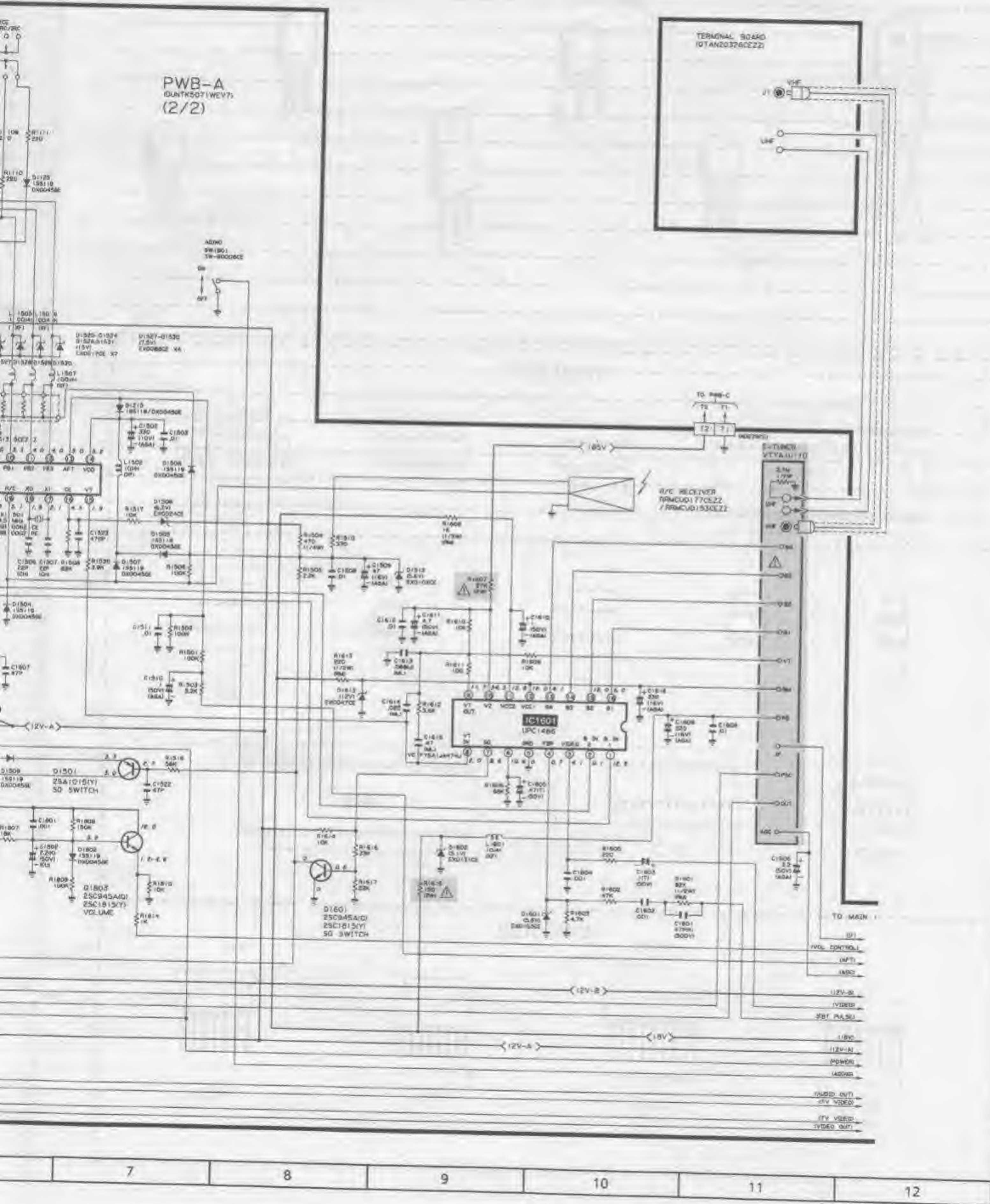
# MAIN-2 CIRCUIT

H  
G  
F  
E  
D  
C  
B  
A

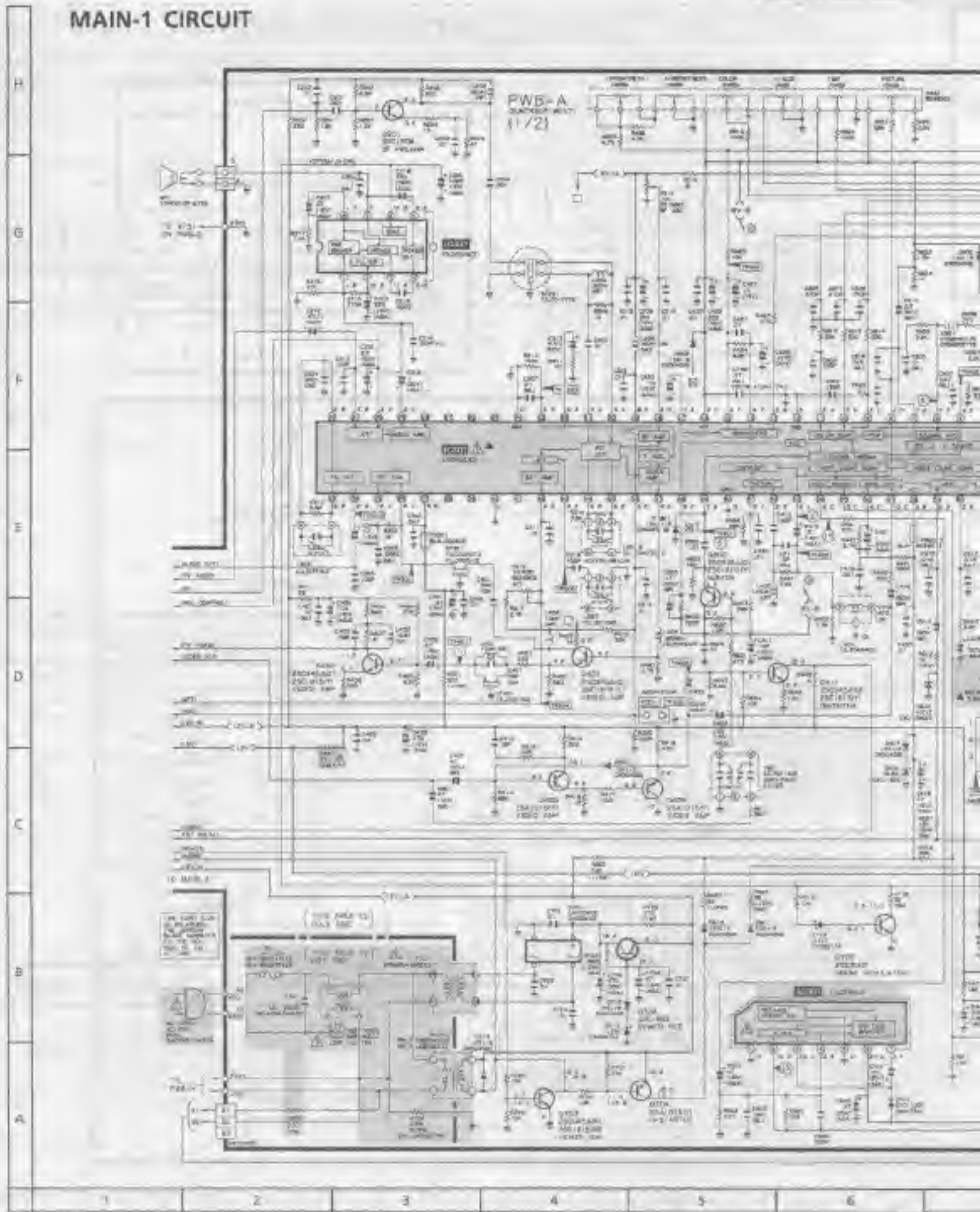


1 2 3 4 5 6 7

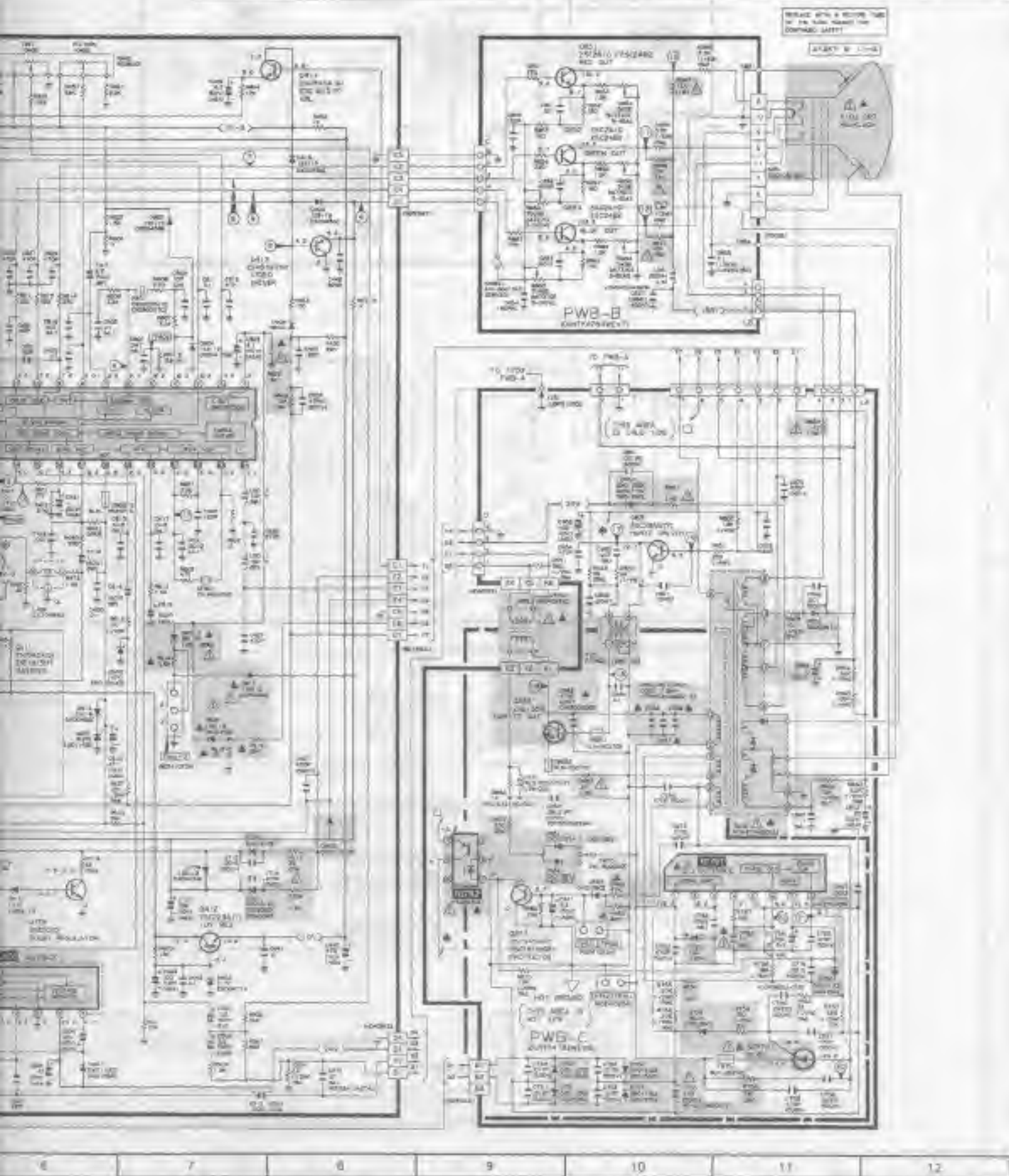
This circuit diagram is a standard one, printed circuits may be subject to change for product improvement without prior notice.



# MAIN-1 CIRCUIT

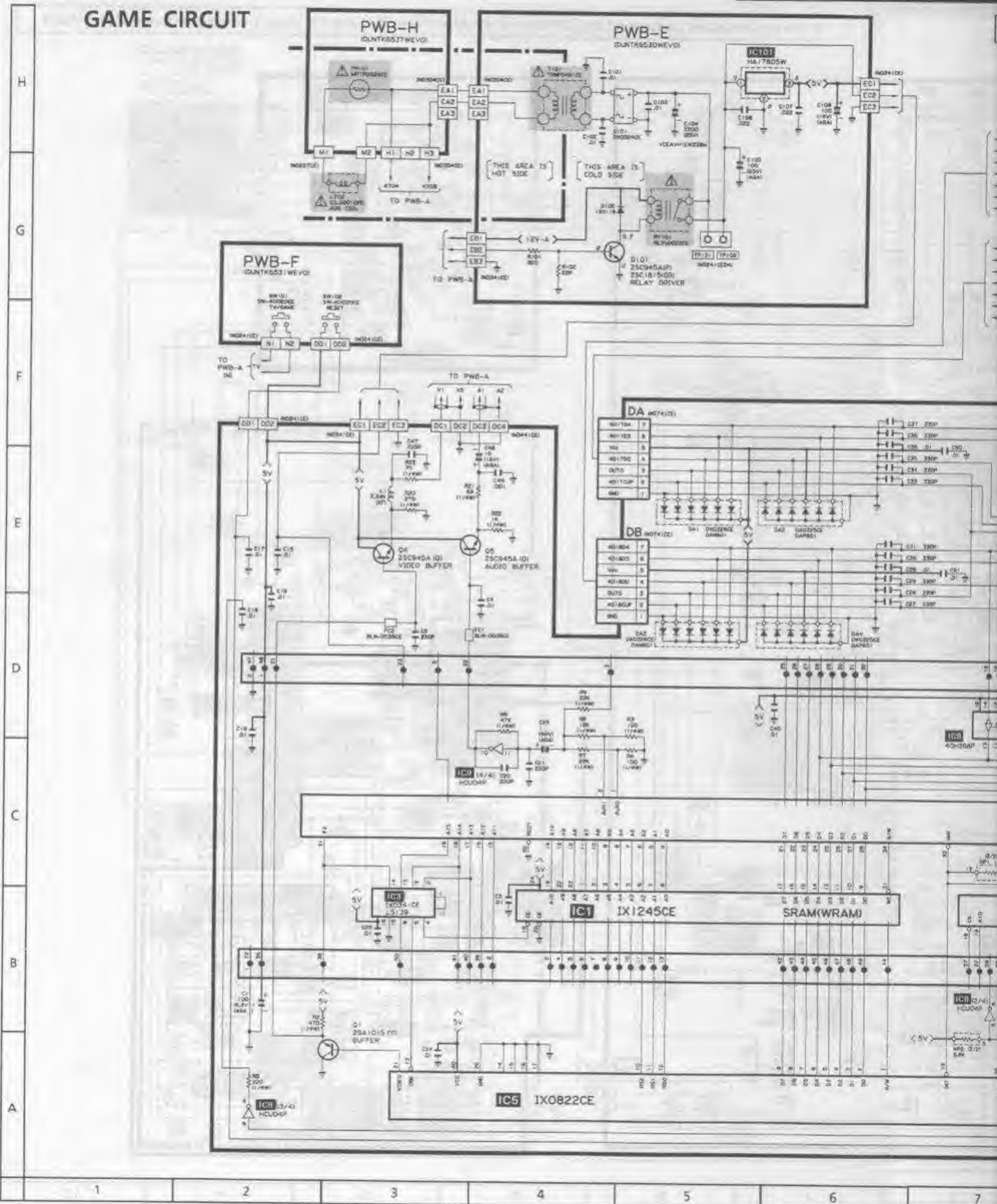


This circuit diagram is a standard one, printed circuits may be subject to change for product improvement without prior notice.

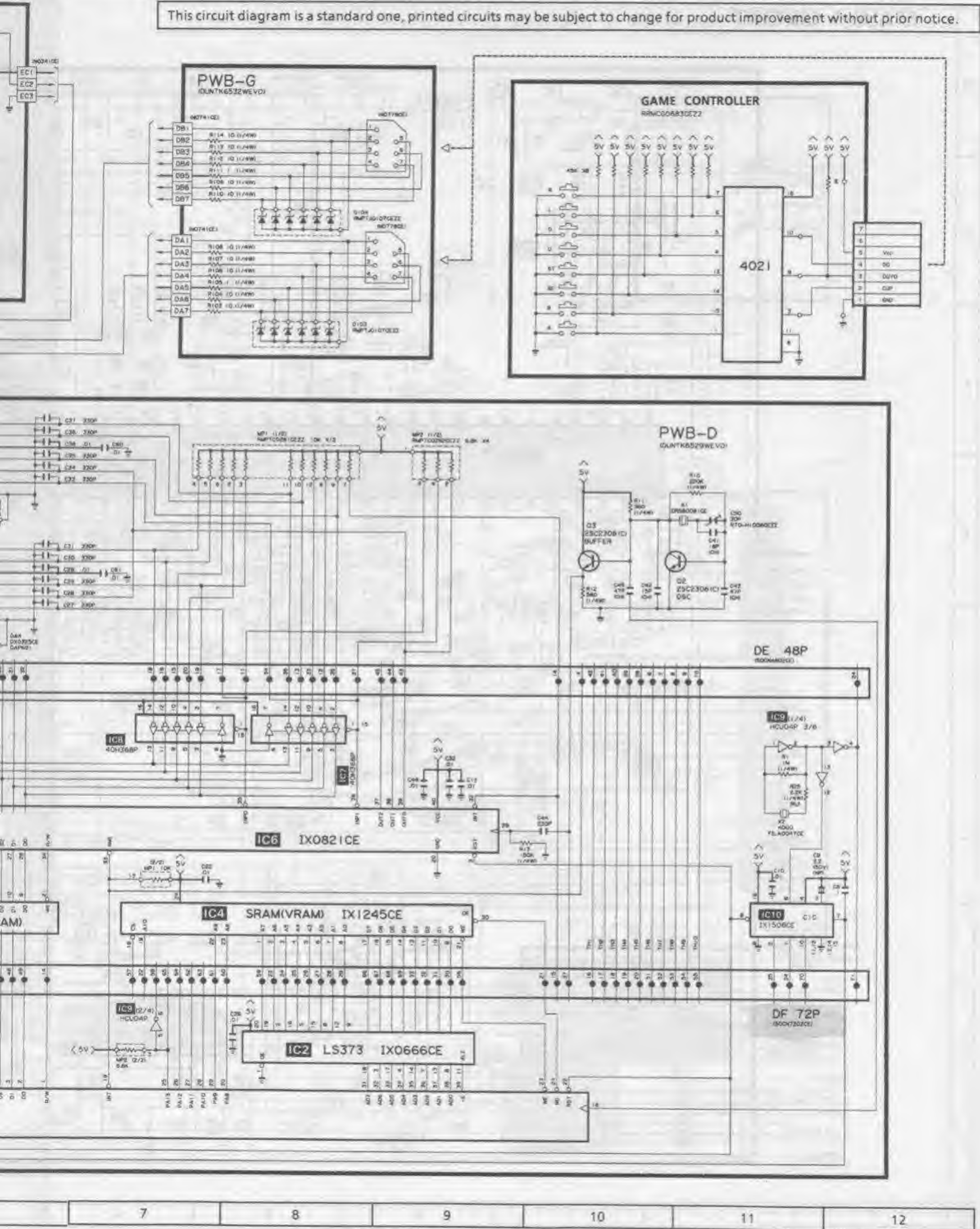




# GAME CIRCUIT



This circuit diagram is a standard one, printed circuits may be subject to change for product improvement without prior notice.







Ref. No.	Part No.	*	Description	Code	Ref. No.	Part No.	*	Description	Code
<b>COILS</b>					<b>CAPACITORS</b>				
L202, 203	VP-RFR82K0000	J	0.82 $\mu$ H	AB	C209, 317, 319, 432, 444, 1204, 1308, 1516	VCEAGA1CW337M	J	330 16V Electrolytic	AC
L205	VP-MKR56M0000	J	0.56 $\mu$ H	AB	C335	VCEAGA1CW108M	J	1000 16V Electrolytic	AD
L206	RCIL10473CEZZ	J	RF Detector	AD	C607, 801	VCE9AA1CW476M	J	47 16V (N.P) Electrolytic	AC
L207	RCIL10510CEZZ	J	AFT	AF	C418, 614	VCE9AA1HW105M	J	1 50V (N.P) Electrolytic	AB
L303	RCIL10374CEZZ	J	Sound Detector	AD	C423, 1609	VCEAGA1CW227M	J	220 16V Electrolytic	AC
L401, 601, 1201, 1501, 1502, 1601	VP-XF100K0000	J	10 $\mu$ H	AB	C424, 1601	VCCSPA2HE470K	J	47p 500V Ceramic	AA
L402	VP-XF150K0000	J	15 $\mu$ H	AB	C435, 442	VCEAGA1CW477M	J	470 16V Electrolytic	AC
L403	VP-QF171K0000	J	120 $\mu$ H	AC	C504	VCEAGA1VW107M	J	100 35V Electrolytic	AC
L404	RCILZ0494CEZZ	J	Delay Line	AF	C505	VCEAGA1VW476M	J	47 35V Electrolytic	AB
L405	RCILP0084CEZZ	J	180MHz Filter	AB	C510	VCEAGA1EW108M	J	1000 25V Electrolytic	AD
L405, 602	VP-MK100K0000	J	10 $\mu$ H	AB	C627, 719	VCKYPA2HB471K	J	470p 500V Ceramic	AA
△ L701	RCILE0087CEZZ or RCILE0088CEZZ	J	Line Filter	AL	△ C701	RC-Q2B20DCEZZ	J	0.1 AC125V UL Spec	AE
L1503 + 1508	VP-XF101K0000	J	100 $\mu$ H	AB	C712	VCKYPA2HB152K	J	0.0015 500V Ceramic	AA
<b>FILTERS</b>					C720	VCEAGA1EW337M	J	330 25V Electrolytic	AC
SF201	RFILC0137CEZZ	J	Surface Acoustic Wave Filter	AB	C726	VCEAGA1VW477M	J	470 35V Electrolytic	AD
CF301	RFILC0029TAZZ or RFILC0001CEZZ	J	Sound Take-Off	AD	C803	VCE9AA1HW674M	J	0.47 50V (N.P) Electrolytic	AC
CF401	RFILC0013CEZZ	J	4.5MHz Trap	AE	C815	VCE9AA1HW225M	J	2.2 50V (N.P) Electrolytic	AB
CF601	RFILA0005CEZZ	J	503kHz	AF	C817, 1319, 1803	VCEAGA1CW107M	J	100 16V Electrolytic	AB
<b>TRANSFORMERS</b>					C1502	VCEAGA1AW337M	J	330 10V Electrolytic	AB
△ T701 T801	RTRNF0416CEZZ RCILV011BCEZZ	J	Power Transformer Band Pass Filter	AV AD					
<b>CONTROLS</b>									
R21A	RVR-B5198CEZZ	J	10k(B) RF-AGC	AC					
R21B	RVR-BY269CEZZ	J	100k(B) AFT	AB					
R462	RVR-R5292CEZZ	J	10k(B) Brightness/ 10k(B) Sub-Bright/ 10k(B) Color/ 1k(B) Vert. Size/ 10k(B) Tint/ 10k(B) Picture	AK					
R1303	RVR-B3265CEZZ	J	10k(B) Audio Level	AB					

Ref. No.	Part No.	*	Description	Code	Ref. No.	Part No.	*	Description	Code
<b>RESISTORS</b>					<b>PWB-B DUNTK4784WEV7 CRT SOCKET UNIT</b>				
<b>RESISTORS</b>					<b>TRANSISTORS</b>				
△ R448	VRS-VV3AB123J	J	12k 1W Oxide Film	AA	Q851, 852, 853	VS2SC2482 / -1 or VS2SC2610 / -1E	J	2SC2482  2SC2610	AD  AD
△ R480	VRS-VV3LB270J	J	27 3W Oxide Film	AB	<b>COIL</b>				
▲▲ R614	VRD-RA2BE393J	J	39k 1/8W Carbon	AA	L851	VP-LK221K0000	J	220μH	AC
▲▲ R615	VRD-RA2BE123J	J	12k 1/8W Carbon	AA	<b>CONTROLS</b>				
▲▲ R616	VRD-RA2BE562J	J	5.6k 1/8W Carbon	AA	R854 859, 864	RVR-B4732CEZZ	J	5k(B) Red Bias, Green Bias, Blue Bias	AC
▲▲ R622	VRD-RA2BE153J	J	15k 1/8W Carbon	AA	R860, 865	RVR-B4727CEZZ	J	300(B) Green Drive, Blue Drive	AC
△ R702	VRW-KV3NC2R7K	J	2.7 7W Cement	AC	<b>CAPACITORS</b>				
△ R706	VRN-VV3AB1R0J	J	1 1W Metal Coating	AA	C855 C857	RC-KZ0016CEZZ VCQ PSC2GA563K	J	0.01 1.4kV Ceramic 0.056 400V Polypro Film	AC AB
△ R717	VRS-VV3LB330J	J	33 3W Oxide Film	AB	<b>RESISTORS</b>				
R718	VRS-VV3LB820J	J	82 3W Oxide Film	AB	△ R867, △ 869, △ 871	VRS-VU3AB123J	J	12k 1W Oxide Film	AA
R725	VRS-VV3AB271J	J	270 1W Oxide Film	AA	<b>SWITCH</b>				
△ R729	VRC-UA2HG275K	J	2.7M 1/2W Solid	AA	SW851	QSW-B0015CEZZ	J	Service (Cut-off)	AC
△ R1607	VRS-VV3DB273J	J	27k 2W Oxide Film	AA	<b>MISCELLANEOUS PART</b>				
△ R1615	VRS-VV3DB151J	J	150 2W Oxide Film	AA	S851	QSOCV0913CEZZ	J	Socket—CRT	AK
RR1501	RMPTC012BCEZZ	J	22k x 7 Resistor Array	AB	<b>MISCELLANEOUS PARTS</b>				
RR1502, 1503	RMPTC0135CEZZ	J	22k x 4 Resistor Array	AB	△ F701	QFS-B4023CEZZ or QFS-B4021GEZZ QFS HD1002CEZZ	J	Fuse—4A 125V AC  Fuse Holder —F701 (2 used)	AC AD AA
<b>SWITCHES AND RELAY</b>					<b>RESISTORS</b>				
SW1100	QSW-S0062CEZZ	J	TV/STD/HRC/IRC	AG	<b>SWITCH</b>				
SW1101, 1102, 1103, 1104	QSW-K0014CEZZ	J	Channel Up, Channel Down, Volume Up, Volume Down	AC	<b>MISCELLANEOUS PARTS</b>				
SW1106	QSW-K0020CEZZ	J	Power	AD	<b>MISCELLANEOUS PART</b>				
SW1801	QSW-B0006CEZZ	J	Aging	AC	<b>MISCELLANEOUS PARTS</b>				
△ RY701	RRLYU0020CEZZ or RRLYU0018CEZZ	J	Power Relay	AK AL	<b>MISCELLANEOUS PARTS</b>				
<b>MISCELLANEOUS PARTS</b>					<b>MISCELLANEOUS PART</b>				
FB301, 603	RBLN-0036CEZZ or RRMCU0177CEZZ or RRMCU0153CEZZ	J	Ferrite Bead Remote Control Receiver	AB AN AR	<b>MISCELLANEOUS PARTS</b>				

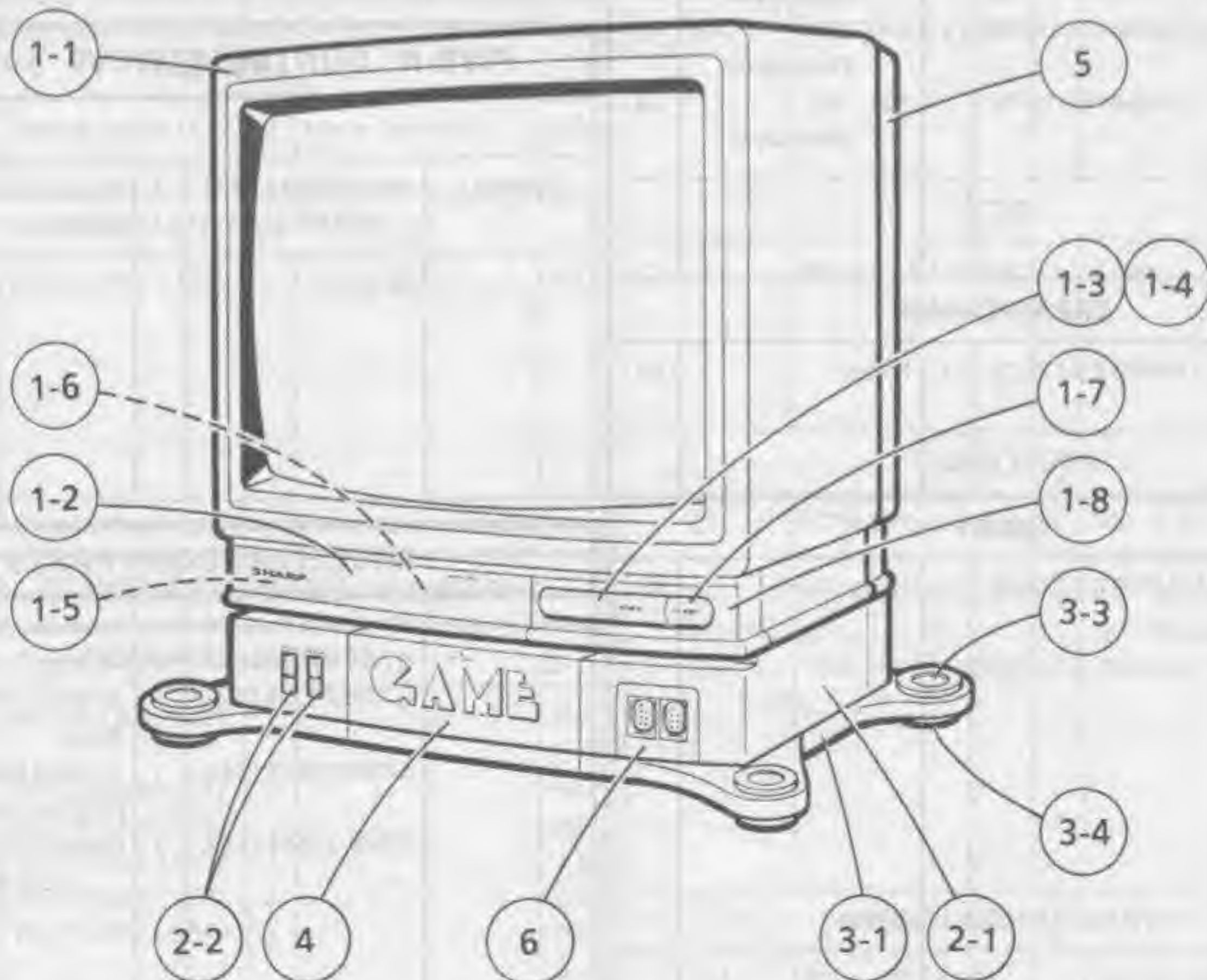
Ref. No.	Part No.	+	Description	Code	Ref. No.	Part No.	+	Description	Code
<b>PWB-C DUNTK4783WEV9 POWER REG. UNIT</b>					<b>CAPACITORS</b>				
<b>INTEGRATED CIRCUITS</b>									
▲▲ IC751	RH-IX0359CEZZ	J		AL	C653	VCEAGA1EW107M	J	100 25V Electrolytic	AD
▲▲ IC752	RH-FX0003CEZZ	J		AK	▲▲ C656,	VCF PFD 3CA 222 J	J	0.00231.6kV Metalized Polyester	AD
					▲▲ 657,				
					▲▲ 658				
					C659,	VCK YPA 2HB 471 K	J	470p 500V Ceramic	AA
					757,				
					759,				
					760,				
					765				
					C660	VCK YPA 2HB 102 K	J	0.001 500V Ceramic	AA
					C661	VCQ PSB 2 JA 102 K	J	0.001 630V Polypro Film	AB
					C664	VCF PFD 2 DB 394 J	J	0.39 200V Metalized Polyester	AE
					▲ C667	RC-KZ0030CEZZ	J	0.0033AC125V Ceramic	AD
					▲ C668	VCEAAA 2EW 106M	J	10 250V Electrolytic	AD
					▲▲ C669	RC-KZ0038CEZZ	J	470p 2kV Ceramic	AB
					C670	VCK YFU 2HB 471 K	J	470p 500V Ceramic	AA
					C672,	VCK YFB 2HE 103 P	J	0.01 500V Ceramic	AB
					751				
					754				
					▲ C755	RC-EZ0082CEZZ	J	470 200V Electrolytic	AG
					C756	VCQ PSB 2DA 473 K	J	0.047 200V Polypro Film	AB
					C758	VCK YPA 2HB 332 K	J	0.0033500V Ceramic	AB
					▲ C761	VCEAAH2CW107M	J	100 160V Electrolytic	AE
					▲▲ C763	VCQYSH 1HM 103 K	J	0.01 50V Mylar	AA
					C764	VCEAGA1EW 337M	J	330 25V Electrolytic	AC
					C776	VCK YPA 2HB 152 K	J	0.0015500V Ceramic	AA
<b>TRANSISTORS</b>									
Q651	VS 25C 2 6 5 9 Y / - 1	J	25C2655	AE					
▲ Q652	VS 25D 1 5 5 4 / / 1 E	J	25D1554	AL					
Q653	VS 25C 9 4 5 A P / - 1	J	25C945A(P)	AB					
	or								
	VS 25C 1 8 1 5 GW-1	J	25C1815(GR)	AB					
<b>DIODES</b>									
▲ D651,	RH-DX0105TAZZ	J	TVR1J	AG					
▲ 652	or								
	RH-DX0132CEZZ	J	EU-1A	AC					
▲ D653	RH-DX0086TAZZ	J	RH1S	AC					
▲ D654	RH-DX0132CEZZ	J	EU-1A	AC					
	or								
	RH-DX0126CEZZ	J	TVR1G(TP)	AC					
	or								
	RH-DX0131CEZZ	J	EU-1	AC					
D655	RH-DX0126CEZZ	J	TVR1G(TP)	AC					
▲ D751	RH-DX0110CEZZ	J	S5277G	AB					
	or								
▲ D754	RH-DX0159CEZZ	J	DS135G-AT	AB					
▲ D755	RH-EX0108CEZZ	J	Zener Diode, 82V	AB					
▲ D756	RH-DX0131CEZZ	J	EU-1	AC					
	or								
	RH-DX0126CEZZ	J	TVR1G(TP)	AC					
▲▲ SCR751	VHS 354 M / / LB1E	J	Silicon Controlled Rectifier	AA					
<b>COIL</b>									
L651	RC-LZ0527CEZZ	J	Linearity Coil	AF					
<b>TRANSFORMERS</b>									
▲ T651	R TTRZ0168CEZZ	J	Horizontal Driver	AH					
▲ T652	R TTRZ1482CEZZ	J	Horizontal Output	BD					

Ref. No.	Part No.	*	Description	Code	Ref. No.	Part No.	*	Description	Code
<b>RESISTORS</b>					<b>TRANSISTORS</b>				
R654	VRS - VV3LB390J	J	39 3W Oxide Film	AB	Q1	VS2SA1015Y/-1	J	2SA1015(Y)	AC
△ R655	VRN - VV3ABR33J	J	0.33 1W Metal Coating	AA	Q2, 3	VS2SC2308C/-1	J	2SC2308	AB
△ R656, △ 661	VRN - VV3AB1R0J	J	1 1W Metal Coating	AA	Q4, 5	VS2SC945AQ/-1	J	2SC945A(Q)	AB
△ R657	VRS - VV3DB331J	J	330 2W Oxide Film	AA	<b>DIODES</b>				
△ R658	VRS - SV2HC100J	J	10 1/2W FR Oxide Film	AA					
△ R662	VRS - SV2HC103J	J	10k 1/2W FR Oxide Film	AA	DA1, 3	RH-DX0326CEZZ	J	Diode Array	AK
△ R664	VRN - VV3ABR47J	J	0.47 1W Metal Coating	AA	DA2, 4	RH-DX0325CEZZ	J	Diode Array	AK
▲△ R665	VRD - RA2BE683J	J	68k 1/8W Carbon	AA	<b>PACKAGED CIRCUIT</b>				
▲△ R666	VRD - RA2BE473J	J	47k 1/8W Carbon	AA					
△ R754	VRS - VV3LB331J	J	330 3W Oxide Film	AB	X1	RCRSB0081CEZZ	J	Crystal	AH
△ R759	VRS - SV2HC151J	J	150 1/2W FR Oxide Film	AA	X2	RFILA0047CEZZ	J		AG
<b>SWITCH</b>					MP1	RMPTC0281CEZZ	J	Resistor Array	AE
SW751	QSW-B0006CEZZ	J	Horiz. Centering	AC	MP2	RMPTC0282CEZZ	J	Resistor Array	AC
<b>MISCELLANEOUS PARTS</b>					<b>COIL</b>				
FB651, 652, 751	RBLN-0037CEZZ	J	Ferrite Bead	AB	L1	VP-XF3R3K0000	J	3.3μH	AB
<b>PWB-D DUNTK6529WEV0 GAME UNIT</b>					<b>CAPACITORS</b>				
<b>INTEGRATED CIRCUITS</b>					C1	VCEAGA0JW107M	J	100 6.3V Electrolytic	AA
IC1, 4	RH-IX1245CEZZ	J		AP	C9	VCE9AA1HW225M	J	2.2 50V (N.P) Electrolytic	AB
IC2	RH-IX0666CEZZ	J		AL	C50	RTO-H1008CEZZ	J	Trimmer, 30p	AC
IC3	RH-IX0341CEZZ	J		AF	<b>MISCELLANEOUS PARTS</b>				
IC5	RH-IX0822CEZZ	J		AZ					
IC6	RH-IX0821CEZZ	J		AY	FC1, 2	RBLN-0036CEZZ	J	Ferrite Bead	AB
IC7, 8	VHITC40H368P/	J		AK					
IC9	VHITCHCU04P-1	J		AE					
IC10	RH-IX1508CEZZ	J		AL					

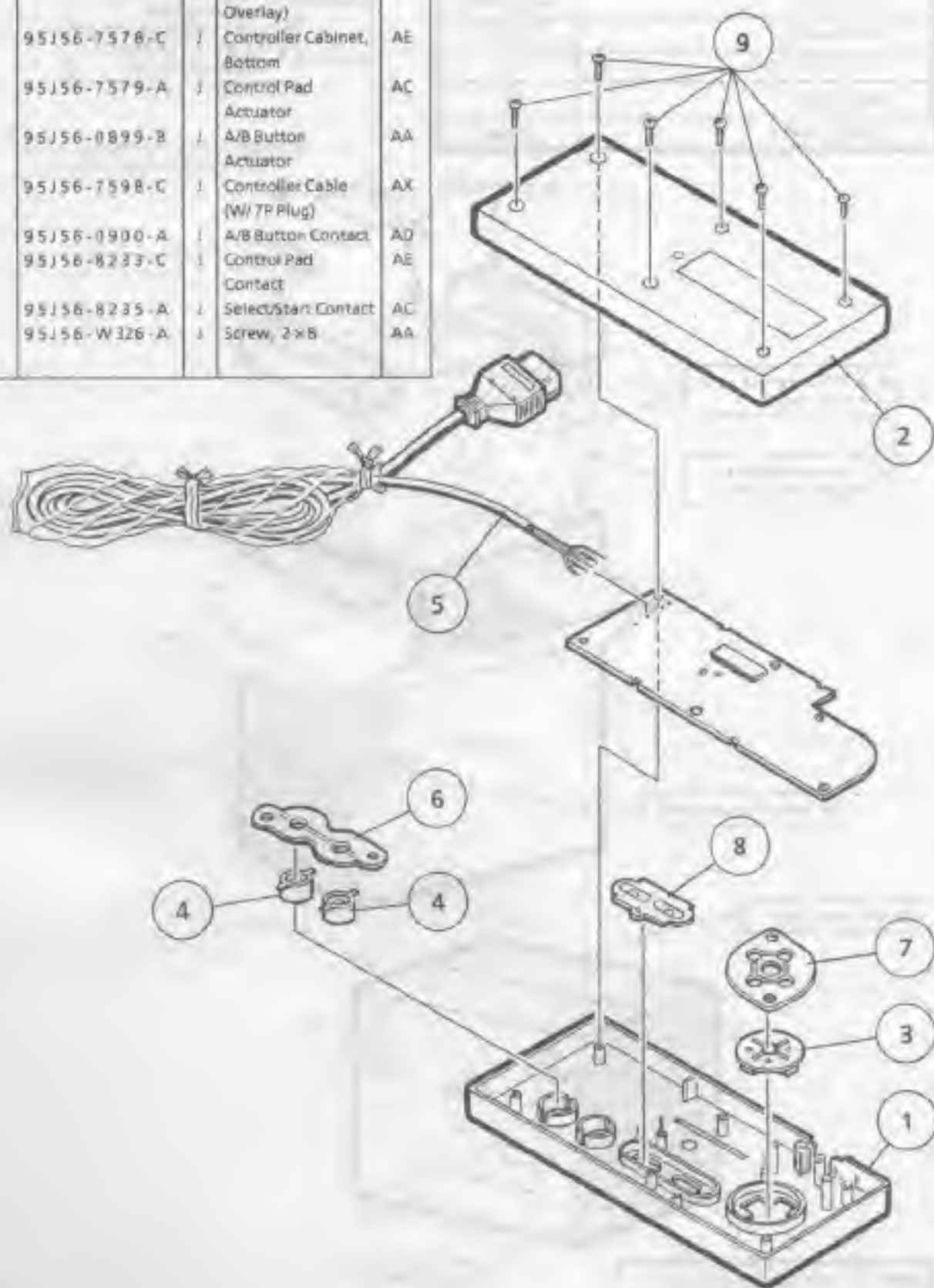


Ref. No.	Part No.	+	Description	Code	Ref. No.	Part No.	+	Description	Code
<b>PWB-E DUNTK6530WEV0 SUB POWER UNIT</b>					<b>PWB-F DUNTK6531WEV0 SWITCH UNIT</b>				
<b>INTEGRATED CIRCUIT</b>					<b>SWITCHES</b>				
IC101	VH1HA17805W-1	J		AD	SW101, 102	Q5W-K0020CE22	J	TV/GAME RESET	AD
<b>TRANSISTOR</b>									
Q101	V525C945A P J -1 or V525C1815GW-H	J	25C945A(P) 25C1815(GR)	AB AB					
<b>DIODES</b>					<b>DIODES</b>				
D101 D102	RH-DX0324CE22 VHD155119 J -1	J J	155119	AC AB	D103, 104	RMP7J0107CE22	J	Zener Diode Array	AE
<b>CAPACITORS</b>					<b>SOCKET</b>				
C104	VCEAVH1E1228M	J	2200 25V Electrolytic	AE		QSOEN0778CE22	J	Socket- (Game Controller)	AE
C105	VCEAGA1EW107M	J	100 25V Electrolytic	AD					
C108	VCEAGA1CW107M	J	100 15V Electrolytic	AR					
<b>TRANSFORMER</b>					<b>PWB-H DUNTK6537WEV0 SUB UNIT</b>				
△ T101	RTRNPD081CE22	J	Power	AX					
<b>RELAY</b>					<b>MISCELLANEOUS PARTS</b>				
△ PY101	RRLYU0027CE22	J	Power Relay	AH	△	VSP0010P-E705	J	Speaker — 8 ohm	AU
						Q ACC 09014 CE5A	J	AC Line Cord	AH
						Q TANZ 0326 CE22	J	Antenna Terminal Board	AS
						R RMOG 0684 CE5A	J	Infrared Remote Control Unit	BX
						R RMOG 0683 CE5A	J	Game Controller (2 pcs)	AX

Ref. No.	Part No.	*	Description	Code	Ref. No.	Part No.	*	Description	Code
<b>CABINET PARTS</b>									
1	CCABA 2 0 9 6 WEV0	R	Cabinet	BV	3	CCABB 2 0 8 8 WEV0	R	Cabinet Complete	BT
			— Front					— Bottom (Game)	
1-1	<i>Not Available</i>	-	Cabinet — Front	—	3-1	<i>Not Available</i>	-	Cabinet	—
1-2	GDOR F 0 0 9 6 PEKA	R	Door	AP				— Bottom (Game)	
1-3	GMADT 0 0 4 6 PEKA	R	Window	AK	3-2	GCOVA 0 0 3 5 PEKA	R	Cover	AF
1-4	H DECQ 0 0 1 5 PESA	R	LED Decoration	AX	3-3	G LEGP 9 0 0 1 PEKA	R	Leg, Top (4 pcs)	AE
1-5	H I NDP 0 0 2 6 PEKA	R	Indication Plate (in Door)	AE	3-4	G LEGP 9 0 0 2 PEKA	R	Leg, Bottom (4 pcs)	AF
1-6	H I NDP 0 0 5 1 PEKA	R	Indication Plate (in Door)	AG	4	GDOR F 0 0 9 3 PEKA	R	Door	AS
1-7	J BTN - 0 0 4 3 PEKD	R	Button, Power	AF	5	GCABB 2 0 3 1 PEKA	R	Cabinet — Rear	BQ
1-8	H PNLC 0 0 3 8 PEKJ	R	Panel	AS	6	GCOVA 0 0 3 4 PEKA	R	Socket Cover	AK
2	CCABA 2 0 9 5 WEV0	R	Cabinet Complete	BK					
			— Top (Game)						
2-1	<i>Not Available</i>	-	Cabinet	—					
			— Top (Game)						
2-2	J BTN - 0 0 5 9 PEKA	R	Button, Select	AK					



Ref. No.	Part No.	+	Description	Code
<b>RRMCG0683CESA GAME CONTROLLER</b>				
1	95156-6106-C	↓	Controller Cabinet, Top (W/ Controller Overlay)	AL
2	95156-7578-C	↓	Controller Cabinet, Bottom	AE
3	95156-7579-A	↓	Control Pad Actuator	AC
4	95156-0899-B	↓	A/B Button Actuator	AA
5	95156-7598-C	↓	Controller Cable (W/ 7P Plug)	AX
6	95156-0900-A	↓	A/B Button Contact	AD
7	95156-8233-C	↓	Control Pad Contact	AE
8	95156-8235-A	↓	Select/Start Contact	AC
9	95156-W326-A	↓	Screw, 2×8	AA



## PACKING OF THE SET

### ● Setting positions of the knobs

Brightness control	5 / 10
Color control	5 / 10
Time control	Best position
Picture control	10 / 10
TV / CATV switch	TV
Aging switch	OFF
Cassette Holder	Release

